SELECTED WATER RESOURCES ABSTRACTS

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 11, NUMBER 15
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W78-06701 -- W78-07200

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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Cold Regions Research and Engineering Lab., Hanover, NH.
G. K. Swinzow.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A039 177, Price codes: A03 in paper copy, A01 in microfiche. CRREL 76-20, June 1976. 29 p, 20 fig, 2 tab, 9 ref. 4A061101A91D.

Descriptors: *Freezing, *Ice, *Crystals, *Ice-water interfaces, *Crystallization, Analytical techniques, Crystal growth, Nucleation, Temperature, Physical properties, Thermocline, Supercooling, Water temperature, Dissolved solids, Water cooling, *Thermal anomaly.

Under ordinary conditions the freezing of water begins with supercooling and ice nucleation and proceeds at 0C at the ice/water interface until ice formation stops. The presence of solutes, high pressure, or disperal in fine pores causes the water to freeze at temperatures below 0C (the so-called freezing point depression). Whenever freezing begins, it proceeds at a constant temperature, or at a temperature which becomes progressively lower. A temperature rise during ice formation was considered here to be an anomaly. Under all equal circumstances, the conditions under which an anomalous freezing temperature is observable appear to be very special. This report described 2 different experiments displaying the anomalous rise of temperature after nucleation and during ice formation. In one case, the water was dispersed in the fine pores of fine powders; in the other case, pure water was frozen in a transparent insulated cell. Photographic observations were made, relations of ice surface to water volume were measured. (Henley-ISWS)
W78-06882

MEASUREMENT OF ABSORPTION COEFFICIENTS OF WATER IN THE VISIBLE SPECTRAL REGION (PHASE I & II),
Missouri Univ., Kansas City.
R. C. Waring, M. R. Querry, P. G. Cary, and R. Jordan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 590. Price codes: A07 in paper copy, A01 in microfiche. Missouri Water Resources Research Center, Rolla, Completion Report, January 27, 1978. 132 p, 3 append. OWRT A-091-MO(3), 14-34-0001-7053 and 7054.

Descriptors: *Attenuation coefficients, Measurement, *Absorption coefficients, Wave lengths, Electromagnetic radiation, *Split laser beam method, Lasers, *Deionized filtered water, Methodology, Analytical techniques, Distilled water, Sea water.

The attenuation coefficient of deionized filtered water was measured in the wave-length regions 418-640 nm and 660-695 nm. A tunable dye laser provided a source of quasiomonochromatic electromagnetic radiation. The data were collected by use of a split laser beam, a reference and sample cell, detector, dual channel boxcar integrator, A-D converter and 9820 Hewlett-Packard calculator. Rayleigh scattering coefficients for local density fluctuations within the liquid were computed in the region 418-640 nm subtracted from the attenuation coefficient, thus providing the sum of the absorption coefficient and the scattering coefficients caused by microscopic particles suspended in the liquid. Values obtained for attenuation coefficients were compared with attenuation coefficients or absorption coefficients from previous investigations of ocean water, deionized filtered water, and distilled water. Specific comparisons of attenuation coefficients were made with absorption coefficient data obtained by adiabatic laser calorimetry. Attenuation coefficients in the region 660-695 nm are presented graphically.
W78-07052

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THE KINETICS OF CALCITE DISSOLUTION IN C02-WATER SYSTEMS AT 5 DEG TO 60 DEG C AND 0.0 TO 1.0 ATM C02,
Geological Survey, Reston, VA. Water Resources Div.; and University of East Anglia, Norwich (England).
L. N. Plummer, T. M. L. Wigley, and D. L. Parkhurst.
American Journal of Science, Vol 278, p 179-216, February 1978. 13 fig, 6 tab, 36 ref.

Descriptors: *Calcite, *Solutes, *Mixing, *Kinetics, *Aqueous solutions, Mechanical properties, Chemical reactions, Temperature, Model studies, Evaluation, *Dissolution kinetics, Activation energy, Reaction mechanisms.

The results are presented of experimental dissolution studies in the pure calcite-water system using both the 'pH-stat' and 'free drift' methods (Morse, 1974). The data were obtained over a wide range of fluid composition varying bulk fluid pH from 2.0 to 7.0 and bulk fluid PC02 from near 0.0 to 1.0 atm. Temperature was varied from approximately 5 to 60 deg C. A mechanistic model is developed that describes the observations and has application to the dissolution of calcite in pure calcite-water systems. (Woodard-USGS)
W78-06936

MEASUREMENT OF ABSORPTION COEFFICIENTS OF WATER IN THE VISIBLE SPECTRAL REGION (PHASE I & II),
Missouri Univ., Kansas City.
For primary bibliographic entry see Field 1A.
W78-07052

2. WATER CYCLE

2A. General

RAINFALL SIMULATION FOR ENVIRONMENTAL APPLICATION,
Oak Ridge National Lab., TN. Environmental Sciences Div.
For primary bibliographic entry see Field 2B.
W78-06726

AN HOURLY PRECIPITATION MODEL FOR RALSTON CREEK,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
R. N. Eli, II, and T. E. Croley, II.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 310. Price codes: A09 in paper copy, A01 in microfiche. IIHR Report No. 192, August 1976. 185 p, 108 fig, 34 tab, 55 ref, 6 append. OWRT A-053-IA(5) and B-055-IA(2).

Descriptors: *Precipitation(Atmospheric), *Watersheds(Basins), *Iowa, *Model studies, Mathematical models, Rainfall, Storms, Floods, Stochastic processes, Monte Carlo method, Climatology, Meteorology, *Ralston Creek(Iowa).

A compilation and an analysis of the Iowa City Ralston Creek hourly precipitation record were made prior to the development of a stochastic data generation precipitation model intended for use in urban flooding hazard studies. The model was to be used to estimate the return periods of extreme storm events by means of extensive data generation. An unbroken historical record of 33 years of point hourly precipitation accumulations was constructed from a high density recording gage network within the watershed. A stochastic precipitation model, using statistical values computed from the historical data, was proposed for the time ocurrence and intensity of storm events. The model was constructed for each of 6 divisions of the year to represent the seasonal non-stationarity observed in the historical data. The resulting data generation model is highly efficient, allowing 33 years of hourly data to be generated in less than 30 seconds on the IBM 360 computer at the University of Iowa. Tests of historical versus generated data indicate that a very precise modeling of storm events is possible with respect to their rate of occurrence and their duration and intensity. Physical considerations support the possibility of model application to other geographical areas. (Sims-ISWS)
W78-06732

SOME STATISTICAL RELATIONSHIPS BETWEEN RAINFALL AND RUNOFF,
New Mexico Inst. of Mining and Technology, Socorro.
V. P. Singh, and Y. K. Birsoy.
Journal of Hydrology, Vol 34, No 3/4, p 251-268, August 1977. 9 fig, 12 ref. OWRT B-054-NMEX(1).

Descriptors: *Rainfall, *Runoff, *Rainfall-runoff relationships, *Model studies, Mathematical models, Distribution patterns, Precipitation(Atmospheric), Streamflow, Annual, Discharge(Water), Statistics, Statistical models, Hydrology.

Relationships were developed between statistical parameters of annual rainfall and parameters of annual runoff. The transformation of rainfall into runoff was characterized by a single linear reservoir. The relationships were compared with those available in the literature and which can be utilized to describe the statistical distribution of runoff, given the distribution of rainfall. It was shown that, for large carryover, the distribution of rainfall. It was shown that, for large carryover, the distribution of runoff always tends to be normal regardless of the distribution of rainfall. (See also W77-11986, W77-11985 and W77-09339) (Sims-ISWS)
W78-06735

UTILIZING CLIMATIC DATA TO APPRAISE POTENTIAL WATER YIELDS,
Kansas Univ., Lawrence. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W78-06850

COMPARISON OF ANNUAL STREAMFLOW MODELS,
Washington Univ., Seattle. Department of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-06851

U. S. PROGRAMS IN RESEARCH DRAINAGE BASINS--AN INTERIM ASSESSMENT.
National Research Council, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 589. Price codes: A04 in paper copy, A01 in microfiche. Final Report, 1977. 64 p, 14 ref, 2 append. NSF-C310, T.O. 153.

Descriptors: *Demonstration watersheds, *International Hydrological Decade, *United States, *Research and development, Hydrology,

Watersheds(Basins), Model studies, Programs, Research priorities, Hydrologic systems, Information exchange, Publication, Water resources, Hydrologic aspects.

This report described and summarized the United States International Hydrological Decade (IHD) program in research drainage basins. The United States has a large number of basins that have been instrumented to satisfy many scientific objectives, ranging from basic water budget studies to studies of the hydrologic effects of land-use and land-treatment practices. The basis U.S. contribution to the IHD in this area was the selection of 60 research basins whose results were assured to be available for international distribution. The Work Group that prepared this final report remains convinced that research drainage basins, regardless of shortcomings in their use in many instances, remain the best means for determining hydrological relationships, for testing theoretical and empirical hypotheses, and for monitoring changes in the earth's environments. Recommendatios were made for future work. (Humphreys-ISWS)
W78-06873

THE APPLICATION OF REMOTE SENSING TO THE DEVELOPMENT AND FORMULATION OF HYDROLOGIC PLANNING MODELS,
Ecosystems International, Inc., Gambrille, Md.
P. A. Castruccio, H. L. Loats, Jr., and T. R. Fowler.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-18633, Price codes: A09 in paper copy, A01 in microfiche. Final Report - NAS8-30539, ECO-76: C-2-1, Gambrille, Md., January 1976. 56 fig, 24 tab, 95 ref, append.

Descriptors: *Remote sensing, *Hydrologic data, *Hydrology, *Mathematical models, *LANDSAT imagery, Planning, Driver phenomena, Peak rate model, Rainfall, Runoff, Sensitivity, Routing module, Watersheds(Basins), Systems analysis, Equations.

The launch of LANDSAT has provided water resources managers and hydrologists with broad prospects for efficient acquisition of essentially real-time data. The reduction of satellite data to practical, operational information requires a clear, easily applicable methodology for converting these data into quantitative hydrologic parameters. Summarized is the development of a model specifically structured to take full advantage of the capabilities of LANDSAT, e.g., its frequent recurrence and consequent ability to determine seasonal variations in a watershed's conditions. The effort was structured along two major routes: (1) the development of a hydrologic planning model specifically based upon remotely sensed inputs, including its test and verification from existing records; and (2) the application of LANDSAT data to supplying the model's quantitative parameters and coefficients. This first phase of the effort focused on the definition of the 'drivers'--those hydrologic processes to which peak runoff is most sensitive--upon the synthesis of a simple yet effective mod3el for the estimation of long-recurrence outflows. Next, this report describes in detail the study's second phase, which includes the development of a routing model for use in sensitivity analyses and a quantitative investigation of the accuracy and completeness of the hydrologic information which can be extracted from remotely-sensed imagery. (Bell-Cornell)
W78-07013

ON SOME MULTI-SITE MULTI-SEASON STREAMFLOW GENERATION MODELS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
J. Kindler, and W. Zuberek.
Research Memorandum RM-76-76, International Institute for Applied Systems Analysis, Laxenburg, Austria, December 1976. 94 p, 11 fig, 19 ref, append.

Descriptors: *Streamflow, *Simulation analysis, *Model studies, *Computer models, *Computer programs, Parametric hydrology, Disaggregation models, Evaluation, Monthly, Seasonal, Systems analysis, Equations.

The relative performance of some multi-site, multi-season models is compared with respect to their adequacy for simulating monthly streamflow sequences. The three models brought under examination are the extended version of the multivariate model proposed by Matalas (1967), the model formulated by Young and Pisano (1968), and the disaggregation model of Valencia and Schaake (1972). Computer implementation of these models has been accomplished in the form of the Multi-site Multi-season Streamflow Generation Package (MMSGP). Evaluation and comparison of the models has been carried out in terms of statistical flow parameters only. Some of these parameters are not explicitly built into the model structure. To conclude, some general comments concerning applicability of each model are presented. (Bell-Cornell)
W78-07014

THE ANALYSIS OF MULTIVARIATE TIME SERIES WITH A VIEW TO APPLICATIONS IN HYDROLOGY,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
J. Ledolter.
Research Memorandum RM-77-11, February 1977. 33 p, 21 ref, append.

Descriptors: *Stochastic processes, *Hydrology, *Model studies, *Streamflow, Estimating, Watersheds(Basins), Simulation analysis, Autocovariance, *Multivariate time series, Equations, Systems analysis, *Time series analysis.

Discussed herein are stochastic models for vector processes, in particular the class of multivariate autoregressive moving average models. Special cases of this class have been discussed in the literature on multi-site streamflow generation and it is shown how these can be brought into a general famework. An iterative model building procedure, consisting of model specification--estimation--diagnostic checking is stressed. Results on model specification are given and it is shown how partial autocovariance matrices can be used to check whether or not multivariate autoregressive models provide adequate representation for (standardized) streamflow sequences. Furthermore, estimation of parameters in multivariate autoregressive moving average models is discussed and it is pointed out that moment estimators can be inefficient when moving average parameters are present. An approximate maximum likelihood estimation procedure is suggested. The paper concludes with a summary of important practical implications for hydrologists. (Bell-Cornell)
W78-07016

WATER RESOURCES AND NEGENTROPY,
National Research Center for Disaster Prevention, Tokyo (Japan).
M. Sugawara.
In: Mathematical Models in Hydrology, Volume 2. Proceedings of the Warsaw Symposium, Poland, July 1971. International Association of Hydrological Sciences Publication No. 101, p 876-878, 1974.

Descriptors: *Water resources, *Negentropy, *Water quality, Biological use, Desalination, Sea water, Statistical meaning, Information, Microorganisms.

In almost all cases of water use, it is not water itself but its negentropy (for example, its coolness and purity) which is consumed. From the point of view of negentropy, we can understand the substantial meaning water resources. In statistical mechanics, entropy is the measure of randomness and the negentropy is the measure of order. Therefore, water resources in a random state is poor in negentropy and consequently has small utility. The idea of entropy is also useful in information. Moreover, it is suggestive for problems of water resources. (See also W77-06708) (Bell-Cornell)
W78-07054

DECONVOLUTION AND AUTOMATIC IDENTIFICATION OF PARAMETERS IN HYDROLOGY,
Ecole Nationale Superieure des Mines de Paris (France).
Y. Emsellem, G. de Marsily, D. Poitrinal, and M. Ratsimiebo.
In: Mathematical Models in Hydrology, Volume 2. Proceedings of the Warsaw Symposium, Poland, July 1971. International Association of Hydrological Sciences Publication No. 101, p 709-735, 1974. 24 fig, 35 ref.

Descriptors: *Parametric hydrology, *Unit response analysis, *Deconvolution, Hydrographs, Storms, Methodology, Rivers, Pollutants, Radioactivity, Algorithms, Systems analysis.

Unit response analysis and its possible uses in hydrology is introduced. This is already well known as the unit hydrograph used in storm analysis. Classical methods for computing the unit response of a system which sometimes lack stability and a new algorithm which does not are presented. Examples of deconvolution and its generalization to other problems of identification are given. (See also W77-06708) (Bell-Cornell)
W78-07055

A SIMPLIFIED HYDROMETEOROLOGIC MODEL AND SOME REGIONAL APPLICATIONS,
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France).
G. Girard, J. P. Fortin, and R. Charbonneau.
In: Mathematical Models in Hydrology, Volume 2. Proceedings of the Warsaw Symposium, Poland, July 1971. International Association of Hydrological Sciences Publication No. 101, p 703-708, 1974. 4 fig, 7 ref.

Descriptors: *Reservoirs, *Computer models, *Parametric hydrology, Streamflow, Regional analysis, Evapotranspiration, Equations, Evaluation, Systems analysis.

The orignality of this distributed parameter mathematical model lies in the extreme simplicity of its vertical structure, in its very easy application to all basins (large or small and regardless of their geographical location), and also in the short time required for its execution on digital electronic computers. The model, called SIM, is presented along with results from its application to basins of widely differing areas subject to quite different climates. Conscious of the imperfections of the model and of the crude hypotheses underlying it, the authors nevertheless point out the potential usefulness of SIM to hydrologists interested in developing conceptual models, as a means of approximating the complex reality of the water cycle in the ground. (See also W77-06708) (Bell-Cornell)
W78-07056

FORMULATION AND ANALYSIS OF SOME DIMENSIONAL CRITERIA OF OPTIMIZATION,
Quebec Univ., Montreal.
For primary bibliographic entry see Field 2E.
W78-07057

USE OF A PIECEWISE LINEAR MODEL WITH SPATIAL . STRUCTURE AND INPUT FOR EVALUATING AGRICULTURAL TO URBAN HYDROLOGIC IMPACT,
Agricultural Research Service, Athens, GA. Southwest Watershed Research Center.

W. C. Mills, W. M. Snyder, T. K. Woody, R. B. Slack, and J. D. Dean.
In: Proceedings of the National Symposium on Urban Hydrology, Hydraulics, and Sediment Control, July 1976. UKY Bu111, College of Engineering, University of Kentucky, Lexington, December 1976, p 215-223. 9 fig, 16 ref.

Descriptors: *Watersheds(Basins), *Linear model, *Hydrologic impact, *Land use, *Simulation analysis, Evaluation, Urban hydrology, Agriculture, Rainfall, Runoff, Grid system, Flow routing, Reservoirs, Equations, Hydrographs, Systems analysis.

A distributed watershed model that provides a framework for evaluating the hydrologic impact of change from agricultural to urban land use is described. The model incorporates a grid system for obtaining and structuring input of spatially distributed watershed and rainfall information. The SCS curve number system is used to quantify watershed soil-cover complexes and is linked to a retention function for determining effective rain and runoff. Routing of overland and channel flow is done by convolution with the impulse response of a linear reservoir. The reservoir time constant is related to Manning's flow equation and a feedback mechanism is incorporated to give piecewise linearization of the watershed response. The watershed model is tested on three instrumented watersheds by simulating runoff hydrographs and comparing them with measure hydrographs. Use of the model for evaluating hydrologic effects of urbanization is demonstrated by simulating and comparing hydrographs for several different land-use patterns. (Bell-Cornell)
W78-07061

METHOD FOR SIMULATING RIVER RUNOFF STATISTICALLY,
G. G. Svanidze.
Soviet Hydrology: Selected Papers, Vol. 15, No. 2, p 114-118, 1976. 2 tab, 1 fig, 16 ref. Translated from Transactions of the IV All-Union Hydrologic Conference (Trudy IV Vsesoyuznogo gidrologicheskogo s'yezda), Vol. 3, p 119-127, 1975.

Descriptors: *Model studies, *Runoff, *Rivers, *Statistical methods, Mathematical studies, Monte Carlo method, Markov processes, Correlation analysis, Foreign research, Foreign countries, Discharge(Water), Monthly, River flow, *USSR, Markov chain.

The solution of current problems of engineering hydrology and river runoff regulation theory, directly associated with the national use of water resources, depends largely on the use of statistical computation methods and, in particular, on the statistical simulation of hydrologic series. At the present time, hydrologic series are constructed with allowance for the intra-annual runoff distribution by the method of fragments or by direct simulation of monthly or 10-day runoff values according to the scheme of a simple or complex Markov chain. The method of fragments was used to simulate mean monthly discharges and to construct a statistical distribution function for a 2,000-year series. Agreement of this function with 80 years of mean monthly discharges was quite satisfactory. (Humphrey-ISWS)
W78-07115

2B. Precipitation

RAINFALL SIMULATION FOR ENVIRONMENTAL APPLICATION,
Oak Ridge National Lab., TN. Environmental Sciences Div.
D. S. Shriner, C. H. Abner, and L. K. Mann.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL-5151. Price codes: A02 in paper copy, A01 in microfiche. Report ORNL-5151, August 1977. 28 p, 4 fig, 3 tab, 19 ref.

Descriptors: *Simulated rainfall, *Rainfall simulators, *Equipment, *Evaluation, On-site investigations, Laboratory tests, Greenhouses, Ions, Cations, Solutes, Rainfall, Precipitation(Atmospheric), Environment, Vegetation effects, Environmental engineering.

Rain simulation systems were designed for field and greenhouse studies. The systems have the capability of reproducing the physical and chemical characteristics of natural rainfall. Important parameters of natural precipitation which were duplicated include: (1) rainfall rate (intensity controllable between 0.5 and 2.7 cm/hr), (2) droplet size range (0.1 - 3.2 mm), and (3) chemical composition (metering pumps supply carefully concentrations of ions to deionized water stream). The systems permit the simulation of variations in rainfall and droplet size similar to that of the natural precipitation. The systems are completely automatic and programmable, allowing unattended operation for periods of up to one week, and have been used to expose not only vegetation, but also soils and engineering materials, making them versatile tools for studies involving simulated precipitation. (Sims-ISWS)
W78-06726

CLEARING FOG BY SEEDING WITH CHARGED WATER DROPS: A NUMERICAL STUDY,
Naval Environmental Prediction Research Facility, Monterey, CA.
For primary bibliographic entry see Field 3B.
W78-06727

AN INTERPRETIVE HISTORY OF THIRTY-YEARS (1945-1975) OF WEATHER MODIFICATION,
Florida State Univ., Tallahassee. Dept. of Statistics.
For primary bibliographic entry see Field 3B.
W78-06729

AN HOURLY PRECIPITATION MODEL FOR RALSTON CREEK,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 2A.
W78-06732

A MULTIDIMENSIONAL MODEL FOR THE SYNTHESIS OF PROCESSES OF AREAL RAINFALL AVERAGES,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
R. L. Lenton, and I. Rodriguez-Iturbe.
Water Resources Research, Vol 13, No 3, p 605-612, June 1977. 6 fig, 2 tab, 9 ref, 2 append. OWRT C-4118 (9021)(16), NWS 4-36738.

Descriptors: *Rainfall, *Synthesis, *Model studies, *Stochastic processes, Areal, Rainfall disposition, Mathematical models, Mathematical studies, Statistical methods, Numerical analysis, Correlation analysis, Analysis, Analytical techniques, Theoretical analysis, Spatial distribution.

The synthesis of processes of areal rainfall was treated by proposing an extension to a previous model of point rainfall synthesis. The proposed model generates sample functions of a random process of areal rainfall that preserves its areal covariance structure, but uses as input not the areal covariance itself, but the point covariance of the corresponding point rainfall process. A numerical application of the model was presented, and the practical implications of preserving areal covariance rather than point covariance when rainfall models are used in conjunction with distributed rainfall-runoff models were discussed. (See also W74-12312) (Humphreys-ISWS)
W78-06734

SOME STATISTICAL RELATIONSHIPS BETWEEN RAINFALL AND RUNOFF,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2A.
W78-06735

INFLUENCE OF INFILTRATION ON OVERLAND FLOW,
Missouri Univ., Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-06736

SPECTRAL ANALYSIS OF HYDROMETEOROLOGICAL TIME SERIES,
Central and Southern Florida Flood Control District, West Palm Beach. Resource Planning Dept.
A. N. Shahane, D. Thomas, and P. Bock.
Water Resources Research, Vol 13, No 1, p 41-49, February 1977. 5 fig, 5 tab, 8 ref, 2 append. OWRT A-033-CONN(5).

Descriptors: *Spatial distribution, *Time series analysis, *Fourier analysis, *Meteorological data, Water vapor, Precipitation(Atmospheric), Runoff, Evapotranspiration, Storage, Watersheds(Basins), Data processing, Analytical techniques, Weather data, Hydrologic data, Meteorology, Hydrology, *Spectral analysis.

As part of the interdisciplinary methodology for exploring the characteristic behavior of the hydrometeorological components of the United States, spectral analysis (consisting of spectral density and cross-spectral density techniques) was employed to provide statistical information in frequency domain. The spectral density technique was applied to analyze the 5 years of mean monthly time series of atmospheric vapor transport, atmospheric precipitable water, runoff, precipitation, evapotranspiration, and change in storage for 76 drainage basins of the United States. And on an experimental basis, cross-spectral techniques were tried for the time series in 10 large combined drainage basins. The outcome from the spectral density analysis provides information about the spatial variation in the periodic properties of these time series over the United States, whereas the cross-spectral analysis illuminates the cross-correlation characteristics of the hydrometeorological data in light of the variations in coherence, partial coherence, and leading and lagging phase angles. (See also W77-10805; W77-03086; W76-00891; W75-09605; W75-01400 and W74-12596) (Sims - ISWS)
W78-06737

SUMMARY OF METROMEX, VOLUME 1: WEATHER ANOMALIES AND IMPACTS,
Illinois State Water Survey, Urbana.
S. A. Changnon, F. A. Huff, P. T. Schickedanz, and J. L. Vogel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 168, Price codes: A12 in paper copy, A01 in microfiche. Bulletin 62, 1977. 264 p, 95 fig, 109 tab, 138 ref. NSF ENV73-07796, GA-28189X, GA-33371, GI-38317.

Descriptors: *Weather modification, *Climatology, *Weather patterns, *Hydrology, *Illinois, *On-site investigations, Weather data, Meteorological data, Data collections, Rainfall, Storms, Synoptic analysis, Rainfall disposition, Analysis, Analytical techniques, Instrumentation, Networks, Diurnal distribution, Distribution patterns, Water resources, Hail, Cities, Ecology, Agriculture, Water quality, Orography, Seasonal, Frequency, Spatial distribution, *METROMEX, Weather anomalies, Thunder, Weather impacts.

This is the first of two volumes presenting the major findings from the 1971-1975 METROMEX field operations at St. Louis. It focused on final interpretations and conclusions obtained primarily through climatological-statistical analyses of spatial and temporal distributions of surface precipitation and severe storms. It also addressed the impacts related to the urban-produced precipitation anomalies. Volume 2 concerned the causes of the anomalies. Key climatic effects are increased cloudiness (+10%), increased total summer rainfall (+30%), and increased severe storm activity (+100%). These increases occur over the city and 10 to 25 miles beyond (east) the urban-industrial areas. The urban-induced anomalies occur most often with squall lines and cold fronts; they maximize in the afternoon and again at night (2100-2400); they appear to be as active in dry periods as in wet periods. Impacts include more runoff, but also more local flooding, soil erosion, silting, and water pollution. The effect of altered weather leads to a 3 to 4% average increase in local crop yields. The urban-induced anomalies are not generally beneficial in the floodplain area and have mixed impacts in the rural uplands. (Humphreys-ISWS)
W78-06738

UTILIZING CLIMATIC DATA TO APPRAISE POTENTIAL WATER YIELDS,
Kansas Univ., Lawrence. Dept. of Civil Engineering.
R. L. Smith.
In: Design of Water Resources Projects With Inadequate Data, Volume 2; Proceedings of the Madrid Symposium, June 1973: International Association of Hydrological Sciences Publication No. 108 (2 Vol), p 253-264, 1974. 4 fig, 1 tab, 10 ref. OWRT B-041-KAN(1).

Descriptors: *Water yield, *Watersheds(Basins), *Water supply, *Water balance, Flow duration, Water resources, Hydrology, Hydrologic aspects, Runoff, Runoff coefficient, Surface waters, Groundwater, Temperature, Climatic data, Precipitation(Atmospheric), Streamflow, Analysis, Analytical techniques, Inadequate data, Ungaged areas.

Precipitation and temperature measurements often represent the only significant hydrologic data available in developing areas. Initial assessments of potential surface and groundwater supplies must build on this limited climatic base. Early in the planning studies there is need for an accurate estimate of mean annual streamflow and of the probable variance in annual flows. These determinations can be made utilizing an empirical function relating the mean annual runoff coefficient to the aforementioned climatic parameters. The relationships have been tested in a wide range of environments, and their general utility can be extended appreciably with limited surface and subsurface observations. Applicability of the recommended relationships was demonstrated by selected case studies involving a variety of problems. Included were examples illustrating the calculation of: (1) mean yields for ungaged areas, (2) the probability distribution of annual flows for ungaged areas, (3) daily flow duration curves, (4) potential yield of selected groundwater areas, and (5) the potential impact of precipitation augmentation on surface water supplies. (See also W78-03783) (Humphreys-ISWS)
W78-06850

REPORT ON THE HAIL SUPPRESSION PROGRAM AT NELSPRUIT, TRANSVAAL, REPUBLIC OF SOUTH AFRICA,
Simpson Weather Associates, Charlottesville, VA.; and Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 3B.
W78-06875

CHICAGO AREA PROGRAM: A MAJOR NEW ATMOSPHERIC EFFORT,
Illinois State Water Survey, Urbana.
S. A. Changnon, Jr., and R. G. Semonin.
Bulletin of the American Meteorological Society, Vol. 59, No. 2, p 153-160, February 1978. 3 fig, 1 tab, 12 ref.

Descriptors: *Projects, *Weather, *Lake Michigan, *Illinois, *Indiana, Rainfall, Weather modification, Pollutants, Storms, Urban runoff, Networks, Rain gages, Instrumentation, Lakes, Cities, Meteorology, *Chicago(Ill).

A series of mesoscale meteorological research projects have developed since 1975 in the area over and around the south end of Lake Michigan. These regionally focused projects, under the label of the Chicago Area Program (CAP), are being performed by scientists from 12 research groups or universities using funds from a variety of state and federal agencies. Efforts to date have led to the installation and operation of a major rain gage network, other weather networks and sondes, several weather radars, meteorological aircraft, and a ship. This sizeable program is addressing five major study areas including lake meteorology, water resources and hydrometeorology, inadvertent weather modification, air pollution and its impacts, and severe weather. Multigroup field experiments and the exchange of data are coordinated at the scientist level. (Sims-ISWS)
W78-06885

AN AVERAGE GEOPOTENTIAL SEA LEVEL SERIES FOR THE UNITED STATES,
National Ocean Survey, Rockville, MD.
For primary bibliographic entry see Field 2L.
W78-06890

GLACIAL LOESS--IS IT REALLY GLACIAL,
Wisconsin Univ., Green Bay. Coll. of Environmental Sciences.
For primary bibliographic entry see Field 2C.
W78-06899

SEEDABILITY OF WINTER OROGRAPHIC STORMS IN UTAH,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 3B.
W78-06926

COMPUTER MODELING OF CUMULUS CLOUDS DURING PROJECT CLOUD CATCHER,
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
For primary bibliographic entry see Field 3B.
W78-06927

RELATION OF BULK PRECIPITATION AND EVAPOTRANSPIRATION TO WATER QUALITY AND WATER RESOURCES, ST. THOMAS, VIRGIN ISLANDS,
Geological Survey, Atlanta, GA. Water Resources Div.; and Geological Survey, Reston, VA. Water Resources Division.
For primary bibliographic entry see Field 2D.
W78-06934

APPLICATION OF THE KALMAN FILTER TO CYCLONE FORECASTING 3. HURRICANE FORECASTING 4. ADDITIONAL TYPHOON FORECASTING.
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
K. Takeuchi.
Research Memorandum RM-76-62, July 1976. 38 p, 10 fig, 5 tab, 2 ref.

Descriptors: *Kalman filter, *Hurricanes, *Forecasting, Linear regression models, Equations, Cyclones, Error covariance matrices, Computer models, Systems analysis.

This is the second part of a report on application of the Kalman filter to cyclone forecasting. Following the preliminary experiments of typhoon forecasting, this paper presents the results of hurricane experiments and further typhoon experiments. The 12 and 24 hour forecasting NHC72 model and the 24 hour forecasting SNT model developed by the National Hurricane Center, NOAA, USA and the Japan Meteorological Agency, respectively, were examined. The improvements obtained by using the Kalman filter over the original models were found to be roughly 10% for hurricane forecasting and 20% for 24 hour typhoon forecasting, on the average, in terms of vector errors. The conclusion drawn by the previous experiments was reconfirmed: The application of the Kalman filter to utilize better simple linear regression models is effective when the original regression model gives consecutively biased forecasts for a considerably long time; it is not effective when the performance of the original model is poor, yet its residual errors are not highly correlated. In addition, a statistical test of the validity of forecasting regression models showed that the structure of the model should be further improved before considering application of the Kalman filter. (Bell-Cornell)
W78-07015

ACCELERATION OF DESSICATION AND POPULATION TRAUMA IN SUB-SAHARAN AFRICA,
Indiana Univ., Bloomington. Dept. of Geography.
For primary bibliographic entry see Field 6G.
W78-07036

PROBABLE EFFECT OF SUMMER WEATHER MODIFICATION ON RUNOFF,
Agricultural Research Service, Boise, ID. Northwest Watershed Research Center.
For primary bibliographic entry see Field 3B.
W78-07086

THE RAIN PARAMETER DIAGRAM: METHODS AND APPLICATIONS,
Clemson Univ., SC. Dept. of Physics and Astronomy.
C. W. Ulbrich, and D. Atlas.
Journal of Geophysical Research, Vol. 83, No. C3, p 1319-1325, March 20, 1978. 6 fig, 20 ref.

Descriptors: *Rainfall, *Analytical techniques, *Radar, *Remote sensing, Data processing, Rain, Raindrops, Particle size, Equations, Meteorology, Rainfall parameters, Diagrams, Rainfall-radar relationships, Water content, Radar reflectivity.

A rain parameter diagram was presented which displays the relationships between all rainfall parameters defined in terms of an exponential drop size distribution. Special emphasis was given to remotely measurable quantities such as radar reflectivity, microwave attenuation, and optical extinction. Although an exponential distribution was used to construct the diagram, it was shown to have general application for arbitrary size distributions and for a wide variety of rainfall-related problems. Some of the problems were: (1) analysis of the sources of error which result from the use of empirical rainfall relations, (2) depiction of the physical differences between different types of rainfall and of the similarity between all empirical relations which apply to the same type of rainfall, and (3) determination of the accuracy with which remote measurements must be made to obtain accurate measurements of rain parameters. A set of overlays was shown for four common radar wavelengths and for four temperatures which display the relationships between microwave attenuation and the other rainfall parameters. Methods were discussed by which these diagrams can be used to determine rainfall parameters remotely in

dual-measurement techniques. The diagrams also can be used to find in these rainfall parameters the errors which result from errors in the two quantities involved in the dual-measurement technique. (Sims-ISWS)
W78-07106

TIME-RESOLVED HAILSTONE ANALYSES AND RADAR STRUCTURE OF SWISS STORMS,
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Lab. fuer Atmosphaerenphysik.
B. Federer, and A. Waldvogel.
Quarterly Journal of the Royal Meteorological Society, Vol. 104, No. 439, p 69-90, January 1978. 18 fig, 3 tab, 47 ref.

Descriptors: *Hail, *Sampling, *Radar, Precipitation(Atmospheric), Storms, Rainfall, Classification, Foreign countries, Statistics, Foreign research, Data processing, Cloud physics, Meteorology, *Switzerland.

Time-resolved, quenched, hailstone size distributions for five hailstorms simultaneously monitored by 10 cm and 3 cm radar (in the PPI and RHI mode, respectively) were measured. A total of 1,220 hailstones were sectioned, and the embryo types (rimed embryos of frozen drop embryos) were classified according to the crystallographic and bubble structure of the center unit and the initial growth layer. For three hailstones the trajectories deduced from crystallography were checked by deuterium analyses. The most important findings were: (1) In storms with relatively warm cloud bases, a big-top zone containing large drops which freeze and become efficient hal embryos exists. (2) The time variation of the parameters of the hailstone spectra reveals the fundamental storm dynamics (multicell or steady-state). (3) Variability of embryo types is smaller in steady-state storms than in multicellular storms, implying that hail formation zones are regions of rather uniform temperature and liquid water content in steady-state storms; whereas in multicell storms, growth occurs in a more heterogeneous environment, possibly in different updraft branches. (4) The two embryo growth mechanisms-riming, and freezing of supercooled drops-coexist in the storms. (5) A characteristic change of embryo type with time is observed consistently in the storms. (6) The size frequency distributions of those frozen drops whose diameters could be measured showed a maximum at 2 mm; this can be explained by 'freezing' an exponential spectrum of raindrops according to the stochastic hypothesis. (Sims-ISWS)
W78-07111

SCHEDULING OF NON-STATIONARY HOURLY PRECIPITATION,
Iowa Univ., Iowa City. Inst. of Hydrological Research.
R. N. Eli, II, and T. E. Croley, II.
(1975). 10 p, 5 fig, 4 tab, 13 ref. OWRT A-053-IA(1).

Descriptors: *Model studies, *Precipitation(Atmospheric), *Precipitation intensity, History, *Iowa, *Storm occurrence model, *Hourly precipitation, Persistence models.

An analysis of the Iowa City Ralston Creek hourly precipitation record was conducted prior to construction of data generation models to be used in an urbanization-flooding hazard study. The historical record of hourly precipitation was constructed from a high density recording gage network within the watershed, with an unbroken length of 33 years (50 years with some discontinuities). A stochastic precipitation model is proposed on phenomenological terms for the time occurrence of storm events. Wet time intervals are scheduled using models for inter-arrival times. Traditional computation difficulties are circumvented in modeling certain time-related persistence effects through the use of independent random variables. The models are presented, described, fit to the data, and discussed; future work is outlined. (Seip-IPA)
W78-07124

2C. Snow, Ice, and Frost

ICE SHEET LOADS ON MARINA PILES,
Federal Highway Administration, Springfield, IL. Illinois Div.
For primary bibliographic entry see Field 8B.
W78-06715

WEST ANTARCTIC ICE SHEET AND CO2 GREENHOUSE EFFECT: A THREAT OF DISASTER,
Ohio State Univ. Research Foundation, Columbus. Inst. of Polar Studies.
For primary bibliographic entry see Field 5B.
W78-06721

PASSIVE MICROWAVE MAPPING OF ICE THICKNESS,
Ohio State Univ., Columbus. Dept. of Electrical Engineering.
J. J. Apinis, and W. H. Peake.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-10611, Price codes: A08 in paper copy, A01 in microfiche. Final Report 3892-2, August 1976. 155 p, 51 fig, 13 tab, 102 ref, 1 append.

Descriptors: *Remote sensing, *Ice cover, *Model studies, Mathematical models, Theoretical analysis, Satellites(Artificial), Ice, Snow, Sea ice, Lake ice, Glaciers, Microwaves, Mapping, Ice thickness, Microwave radiometers.

Basic calculations are presented from which the feasibility of a scanning microwave radiometer system for mapping the thickness of lake ice may be evaluated. An analytical model for the apparent brightness temperature as a function of ice thickness was developed and elaborated to include such variables as galactic and atmospheric noise, aspect angle, polarization, temperature gradient in the ice, the presence of transition layers such as snow, slush, and water, increased loss due to air inclusions in the ice layer, and the presence of multiple ice thicknesses within the antenna footprint. It was found that brightness temperature measurements at six or seven frequencies in the range of 0.4 to 0.7 GHz were required to obtain unambiguous thickness estimates. A number of data processing methods were examined; a minimum-distance algorithm and a ternary brightness temperature quantization scheme were found to give accuracies of about 1 cm for ice thicknesses up to one meter. A brief system study of the effects of antenna beamwidth, scanning rate, receiver bandwidth, noise figure, and integration time showed that the receiver sensitivity requirements could be met with state-of-the-art components. The radiometric system was found to fail for sea ice thickness measurement due to the very high losses of sea ice. (Sims-ISWS)
W78-06728

SNOW BACKSCATTER IN THE 1-8 GHZ REGION,
Kansas Univ./Center for Research, Inc., Lawrence. Remote Sensing Lab.
H. Stiles, F. Ulaby, B. Hanson, and L. Dellwig.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-16193, Price codes: A03 in paper copy, A01 in microfiche. RSL Technical Report 177-61, June 1976. 105 p, 46 fig, 1 tab, 24 ref, 2 append. NASA NAS9-10261.

Descriptors: *Snow, *Microwaves, *Remote sensing, Radar, Physical properties, Moisture content, Snowpacks, Measurement, Depth, Ice, On-site investigations, Equipment, Soil water, Soil temperature, Snow water content.

The 1-8 GHz Microwave Active Spectrometer (MAS 1-8) system was used to measure the backscatter response of snow covered ground between 21 February and 23 April 1975. The scattering coefficient was measured for all linear polarization combinations at angles of incidence between nadir and 70 deg. Ground truth data consisted of soil moisture, soil temperature profile, snow depth, snow temperature profile, and snow water equivalent. The results of the experiment indicated that the radar sensitivity to snow water equivalent increases in magnitude with increasing frequency and is almost angle independent for angles of incidence higher than 30 deg, particularly at the higher frequencies. In the 50-70 deg angular range and in the 6-8 GHz frequency range, the sensitivity is typically between -0.4 dB/.1 g/sq m and -0.5 dB/.1 g/sq m, and the associated linear correlation coefficient has a magnitude of about 0.8. (Sims-ISWS)
W78-06731

APPARENT ANOMALY IN FREEZING OF ORDINARY WATER,
Cold Regions Research and Engineering Lab., Hanover, NH.
For primary bibliographic entry see Field 1A.
W78-06882

THE PREDICTION OF UNFROZEN WATER CONTENTS IN FROZEN SOILS FROM LIQUID LIMIT DETERMINATIONS,
Cold Regions Research and Engineering Lab., Hanover, NH.
A. R. Tice, D. M. Anderson, and A. Banin.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A026 632, Price codes: A02 in paper copy, A01 in microfiche. CRREL Report 76-8, April 1976. 13 p, 8 fig, 1 tab, 30 ref. DA 4A161102AT24.

Descriptors: *Frozen soils, *Permafrost, *Liquid limits, *Soil mechanics, *Frozen ground, Ice, Soil types, Thawing, Tundra, Freezing, Environmental effects, Soil properties, Earth materials, Soil stability, Soil chemical properties.

During the past decade a number of methods for measuring the amount of unfrozen water in partially frozen ground have emerged. Means of quickly and simply predicting unfrozen water contents in clay have become increasingly important with the growth of interest in encapsulating clay soils compacted at low water contents to serve as base courses for roads. Unfortunately the measurements require sophisticated equipment and, in most instances, specially trained operators. In an effort to simplify the task of obtaining water-ice phase composition data, methods of calculating phase composition curves from other, simpler measurements on soils have been sought. In this paper a method was presented of deriving the measurement of unfrozen water contents at various temperatures from liquid limit determinations. Previous studies have indicated that phase composition curves can be well represented by a simple power equation, W sub u = alpha times theta to the beta power, where W sub u is the unfrozen water content in g H2O/g soil, theta is the temperature in degrees below freezing and alpha and beta are empirical constants characteristic of a given soil. When the liquid limits of a large group of soils encompassing a wide range of textures were regressed against values of alpha, the correlation was found to be remarkably good. This has permitted the development of a prediction equation of sufficient accuracy for general engineering use. (Henley-ISWS)
W78-06883

INTERPRETATION OF THE TENSILE STRENGTH OF ICE UNDER TRIAXIAL STRESSES,
Cold Regions Research and Engineering Lab., Hanover, NH.
D. E. Nevel, and F. D. Haynes.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A027 042, Price codes: A02 in paper copy, A01 in microfiche. CRREL Report 76-5, April 1976. 12 p, 7 fig, 12 ref.

Descriptors: *Ice, *Tensile strength, *Tensile stress, *Model studies, Mathematical models, Strength, Stress, Theoretical analysis, Snow, Mechanical properties.

Griffith, and later Babel, have developed previously a tensile fracture criterion for a two-dimensional state of stress. This theory was extended to the compression-compression region. From this theory, the angle of fracture was developed. The theory was extended conceptually to three dimensions. Triaxial test data by Haynes for snow-ice were shown in this three-dimensional fracture theory. The test data were slightly less than those predicted when the void in the snow-ice is spherical. (Sims-ISWS)
W78-06884

ARAPAHO ROCK GLACIER, COLORADO FRONT RANGE,
Eastern Illinois Univ., Charleston. Dept. of Geography and Geology.
R. G. Wallace.
Transactions of the Illinois State Academy of Science, Vol. 69, No. 4, p 415-424, December 1977. 3 fig, 19 ref.

Descriptors: *Glaciers, *Rocks, *Colorado, *Rocky Mountain region, Ice, Movement, Melting, On-site investigations, Mountains, Cirques, Geology, Glaciology, Rock glaciers, Front Range(Colo).

Considerable field evidence, such as ridge and furrow patterns, steep fronts, lichen growth, and other data from plane table surveys, along the Colorado Front Range shows that rock glaciers there have moved in the past and are moving presently. This study showed that Arapaho rock glacier, which occupies part of a cirque at the head of Arapaho Valley west of Boulder, Colorado, has an ice glacier buried beneath rock cover in the upvalley one-third of glacier, and the downvalley two-thirds contains rock debris and interstitial ice. The buried glacier may be helpful, but it is not essential, in the movement of this rock glacier, rather, interstitial ice is probably the primary factor. Arapaho rock glacier may have originated when interstitial ice developed in accumulations of talus at the front of the present buried rock glacier. (Sims-ISWS)
W78-06886

GLACIAL LOESS--IS IT REALLY GLACIAL,
Wisconsin Univ., Green Bay. Coll. of Environmental Sciences.
J. M. Moran.
Transactions of the Illinois State Academy of Science, Vol. 69, No. 4, p 479-484, December 1977. 1 fig, 15 ref.

Descriptors: *Loess, *Glaciers, *Paleoclimatology, Soils, Glacial soils, Erosion, Wind erosion, Flood plains, Melt water, Sedimentation, Glacial sediments, Silts, Geology, Climatology.

Glacial-nonglacial climatic shifts exhibit an episodic or square-wave behavior, while the growth-decay response of glacial ice approximates a normal curve. If this model is realistic, Laurentide melt-water discharge and alluviation along proglacial drainageways peaked several thousand years after the last major Wisconsinan climatic shift from dominantly glacial to dominantly nonglacial regimes. This also implies that the principal period of wind erosion of floodplain deposits (and loess accumulation) occurred during climatic episodes that were distinctly nonglacial. (Sims-ISWS)
W78-06899

SEEDABILITY OF WINTER OROGRAPHIC STORMS IN UTAH,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 3B.
W78-06926

PRODUCTION PROCESSES UNDER THE ICE IN LAKE ST. CLAIR I. IRRADIATION AND TEMPERATURE,
Windsor Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-07039

PRODUCTION PROCESSES UNDER THE ICE IN LAKE ST. CLAIR II. NUTRIENTS (SILICATE) AS A LIMITING FACTOR,
Windsor Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-07040

GEOGRAPHIC INVESTIGATIONS OF SNOW AVALANCHES AND MUDFLOWS,
Moscow State Univ., Moscow (USSR). Lab. of Snow Avalanche and Mudflow Problems.
G. K. Tushinskiy, and S. M. Fleyshman.
Soviet Hydrology: Selected Papers, Vol. 15, No. 2, p 163-166, 1976. 2 fig. Translated from Herald of Moscow University (Vestnik Moskovskogo universiteta, No. 3, p 62-69, 1976.

Descriptors: *Avalanches, *Mudflows, *Maps, *Foreign countries, Snow, Regions, Hazards, Foreign research, Laboratories, Research and development, *USSR.

The huge territory of the Soviet Union includes a large number of mountains and high-mountain regions. Snow avalanches and mudflows are typical of almost all of them. One of the main tasks of the Laboratory of Snow Avalanche and Mudflow Problems is to forecast the site of avalanches and mudflows. A second and equally important task of the Laboratory is to study the physics and mechanics of formation, movement, and deposition of snow avalanches and mudflows for the purpose of improving control measures under various physiographic conditions. Creep and compaction were studied experimentally and theoretically, and some patterns in the changes of snow during these processes were identified. Two general maps showed the distribution of mudflow hazard regions and avalanche hazard regions. Varying degrees of hazard were indicated. (Humphreys-ISWS)
W78-07117

GLACIER SURVEYS IN BRITISH COLUMBIA - 1972,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
I. A. Reid, and J. O. G. Charbonneau.
Report Series No. 54, 1978, 19 p, 10 fig, 8 ref, 31 tab, 5 maps.

Descriptors: *Glaciers, *Surveys, Streamflow, Maps, Runoff, Methodology, Photogrammetry, Analytical techniques, Water quantity, On-site investigations, Mathematics, *Canada, *British Columbia, Volumetric changes, Directional changes, Areal changes, Linear changes, Sentinel Glacier, Sphinx Glacier, Nadahini Glacier, Kokanee Glacier, Bugaboo Glacier.

Glaciers act as natural regulators, storing water in winter and releasing it in summer. To gain some understanding of this phenomenon and the contribution which glaciers make to streamflow, the predecessors of the Water Survey of Canada began glacier surveys in 1945. The earlier surveys offered some clue to the role of the glacier, but the data collected were not sufficient to provide the overall picture. Following adoption of photogrammetric survey techniques, however, the glacier surveys have evolved to the extent that it is now feasible to produce a series of maps from which the linear, areal, directional and volumetric changes can be determined. The surveys have revealed that the glaciers, in general, are becoming smaller in size; hence the regulating effect on streamflow is diminishing. (WATDOC)
W78-07169

2D. Evaporation and Transpiration

SPECTRAL ANALYSIS OF HYDROMETEOROLOGICAL TIME SERIES,
Central and Southern Florida Flood Control District, West Palm Beach. Resource Planning Dept.
For primary bibliographic entry see Field 2B.
W78-06737

GEOLOGICAL APPLICATIONS OF NIMBUS RADIATION DATA IN THE MIDDLE EAST,
National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center.
For primary bibliographic entry see Field 7B.
W78-06869

RELATION OF BULK PRECIPITATION AND EVAPOTRANSPIRATION TO WATER QUALITY AND WATER RESOURCES, ST. THOMAS, VIRGIN ISLANDS,
Geological Survey, Atlanta, GA. Water Resources Div.; and Geological Survey, Reston, VA. Water Resources Division.
D. G. Jordan, and D. W. Fisher.
Available from Branch of Distribution, USGS 1200 S. Eads St., Arlington, VA 22202, price $1.40. Water-Supply Paper 1663-I, 1977. 130 p, 12 fig, 4 tab, 13 ref.

Descriptors: *Rainfall, *Fallout, *Water quality, *Evapotranspiration, *Virgin Islands, Surface waters, Groundwater recharge, Chemical properties, Base flow, Evaluation, *St. Thomas(Virgin Islands), *Bulk precipitation, Maritime environment.

St. Thomas, Virgin Islands, is composed almost entirely of volcanic rocks mantled by a thin soil seldom more than 2 feet thick. Rainfall, averaging about 40 inches annually, has an orographic distribution related to the central ridge of the island, altitude 600 to 1500 feet, and the easterly to northeasterly trade winds. The mineral content of bulk precipitation falling on the island is derived principally from the sea although soil dust contributes much of the calcium, sodium, and bicarbonate. Two-thirds of the sulfate in the precipitation is provided by sea salts; the remainder is derived from other sources. The concentration of the constituents of bulk precipitation fluctuates widely month to month, but the load of the constituents shows little monthly variation. Bulk precipitation is concentrated on the land surface and in the soil zone. From there it is carried into the ground water during recharge or is removed by storm-water runoff. It is the principal source of minerals in the waters of the island. Soil-moisture demand and evaporation limits recharge to 1 and 2 inches annually for the greater part of the island. Evapotranspiration also occurs directly from the aquifer. The salts left further increase the mineralization of the ground water. Water loss from the aquifer by evapotranspiration ranges from 40 to 80 percent of the recharge. (Woodard-USGS)
W78-06934

WATER EVAPORATION FROM THE SOIL IN THE MAIN TYPES OF FORESTS IN THE BELORUSSIAN POLES'YE,
Belorussian Scientific Research Inst. of Forest Management, Minsk (USSR).
M. F. Andreychik.
Soviet Hydrology: Selected Papers, Vol. 15, No. 3, p 250-255, 1976. 3 fig, 4 tab, 20 ref. Translated from Lesovedeiya, No. 2, p 18-26, March-April 1976.

Descriptors: *Evaporation, *Soil, *Forests, *Vegetation effects, Moisture content, Trees, Pine trees, Vegetation, Evapotranspiration, Soil horizons, Heat transfer, Solar radiation, Forestry, *USSR.

The heat exchange and phase transformations of water in the upper 20 cm of the root zone in tree stands of varying density of the most common types of forests were analyzed. Evaporation was determined from the heat budget of the soil during the growing periods of 1971-73. The nature of hydrophysical processes in tree stands of a density of 0.7 was found to be much more distinct than in stands with a density of 0.9-1.1. For example, internal evaporation in the root zone of stands of moderate density was 2-5 times higher than in high-density stands. (Sims-ISWS)
W78-07113

2E. Streamflow and Runoff

AN HOURLY PRECIPITATION MODEL FOR RALSTON CREEK,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 2A.
W78-06732

SOME STATISTICAL RELATIONSHIPS BETWEEN RAINFALL AND RUNOFF,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2A.
W78-06735

INFLUENCE OF INFILTRATION ON OVERLAND FLOW,
Missouri Univ., Columbia. Dept. of Civil Engineering.
A. T. Hjelmfelt, Jr.
Journal of Hydrology, Vol 36, No 1/2, p 179-185, January 1978. 3 fig, 5 ref. OWRT A-076-MO(2).

Descriptors: *Overland flow, *Infiltration, *Model studies, Mathematical models, Runoff, Precipitation(Atmospheric), Rainfall, Infiltration rates, Flow, Storage, Hydrographs, Equations, Hydrology, Wave equations.

A mathematical model of overland flow with constant rainfall intensity but with varying infiltration rate was presented. The flow was described by the kinematic wave equations and the infiltration by the U.S. Soil Conservation Service storage-depletion process. The outflow hydrograph was determined for various infiltration conditions and compared with measured hydrographs. The influence of infiltration on the time of concentration also was indicated. (Sims-ISWS)
W78-06736

SPECTRAL ANALYSIS OF HYDROMETEOROLOGICAL TIME SERIES,
Central and Southern Florida Flood Control District, West Palm Beach. Resource Planning Dept.
For primary bibliographic entry see Field 2B.
W78-06737

FLOOD HAZARD IN THE UNITED STATES: A RESEARCH ASSESSMENT,
Colorado Univ., Boulder. Inst. of Behavioral Science.
For primary bibliographic entry see Field 6F.
W78-06786

NONSTATIONARY STREAMFLOW FROM URBANIZING WATERSHEDS: A CASE STUDY,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 4C.
W78-06823

COMPARISON OF ANNUAL STREAMFLOW MODELS,
Washington Univ., Seattle. Department of Civil Engineering.
S. J. Burges, and D. P. Lettenmaier.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY9, Proceedings Paper 13194, p 991-1006, September 1977. 9 fig, 1 tab, 23 ref, 2 append. OWRT A-078-WASH(2).

Descriptors: *Streamflow, *Model studies, *Mathematical models, Annual, Statistical models, Markov processes, Flow, Correlation analysis, Forecasting, Precipitation(Atmospheric), Runoff, Streams, Rivers, Hydrology.

The operational importance of the form of an annual synthetic streamflow model and the level of its parameters were investigated. Both short-term and long-tern memory models were used to generate flow traces which were run through the Thomas-Fiering Sequent Peak Algorithm. Population parameters were used in the models in all cases. Operation life was held constant at 40 yrs. The coupled flow generation-flow demand situations examined showed the marginal distribution parameters to be much more important, even in cases where substantial long-term persistence is present, than had earlier been thought. The most important conclusion to be drawn from the test is that the effect of uncertainty in any of the model parameters cannot be dismissed a priori; failure to estimate and to model accurately the marginal distribution as well as the correlation structure of flow may result in substantial design errors. (Sims-ISWS)
W78-06851

A DISTRIBUTED KINEMATIC MODEL OF UPLAND WATERSHEDS,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 4D.
W78-06876

COMPUTATION OF THE ROUGHNESS OF GRASS COVERS OF DRAINAGE CHANNELS,
For primary bibliographic entry see Field 8B.
W78-06901

MEAN ANNUAL RUNOFF IN THE UPPER OHIO RIVER BASIN, 1941-70, AND ITS HISTORICAL VARIATION,
Geological Survey, Reston, VA. Water Resources Div.
R. M. Beall.
Available from the Supt. of Documents, GPO, Washington, DC 20402. Price $2.00. Water-Supply Paper 2042, 1978. 32 p, 6 fig, 1 plate, 4 tab, 9 ref.

Descriptors: *Average runoff, *Ohio River, *Tributaries, *Streamflow, *Flow rates, Annual, River basins, Hydrologic data, Drainage area, Gaging stations, *Upper Ohio River basin, Mean annual runoff, 30-year reference period, Historical variation.

A map of the Ohio River basin above the Muskingum River shows patterns of mean annual runoff for the new climatologic and hydrologic reference period, 1941-70, and provides an up-to-date, consistent basis for consideration of this streamflow characteristic. The primary data base consisted of 98 long-term gaging-station records collected within this 27,300-square-mile headwater area of the Ohio River basin. Supplemental information was derived from 83 short-term records. Mean annual runoff is at a regional minimum of less than 12 inches in an area extending from the northern West Virginia panhandle to the headwaters of the Mahoning River in Ohio. Mean annual runoff of more than 32 inches occurs in parts of the upper Cheat River basin in West Virginia. The zone of high runoff trends northeastward along the western slopes of the Allegheny Mountains; magnitudes diminish to about 25 inches at the eastern basin boundary near Ebensburg, Pa. Runoff of this magnitude occurs also in a band across the upper Allegheny River basin in Pennsylvania. Ratios of mean annual discharge to the 30-year reference-period average were computed for each year of record for all long-term gaging stations. Annual discharges have ranged from about 30 percent to 200 percent of the 30-year mean. (Woodard-USGS)
W78-06932

APPLICATION OF A MATHEMATICAL MODEL TO ESTIMATE WATER LEVELS,
Geological Survey, Reston, VA. Water Resources Div.; and Geological Survey, Boston, MA. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-06944

THE APPLICATION OF REMOTE SENSING TO THE DEVELOPMENT AND FORMULATION OF HYDROLOGIC PLANNING MODELS,
Ecosystems International, Inc., Gambrille, Md.
For primary bibliographic entry see Field 2A.
W78-07013

ON SOME MULTI-SITE MULTI-SEASON STREAMFLOW GENERATION MODELS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 2A.
W78-07014

THE ANALYSIS OF MULTIVARIATE TIME SERIES WITH A VIEW TO APPLICATIONS IN HYDROLOGY,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 2A.
W78-07016

DECONVOLUTION AND AUTOMATIC IDENTIFICATION OF PARAMETERS IN HYDROLOGY,
Ecole Nationale Superieure des Mines de Paris (France).
For primary bibliographic entry see Field 2A.
W78-07055

FORMULATION AND ANALYSIS OF SOME DIMENSIONAL CRITERIA OF OPTIMIZATION,
Quebec Univ., Montreal.
J. P. Fortin, R. Charbonneau, J. Lefevre, and G. Girard.
In: Mathematical Models in Hydrology, Volume 2. Proceedings of the Warsaw Symposium, Poland, July 1971. International Association of Hydrological Sciences Publication No. 101, p 548-557, 1974. 4 fig, 6 ref.

Descriptors: *Simulation analysis, *Automatic optimization, *Hydrology, Flow, Equations, *Optimization.

Criteria which are dimensional, such as the standard error of estimate or any derived or analogous formula, lead to different values for a similar relative precision according to the order of magnitude of the flow. Thus, the authors suggest a certain number of non-dimensional criteria in order not only to judge the quality of the simulation, but also with a view to the choice of an automatic optimization criterion. They have analyzed the sensitivity of those criteria in a few cases which could occur in reality. Even if the parameter being optimized remains the essential element in determining the choice of a criterion, results seem to indicate that one of these criteria behaves well in all known cases and is relatively sensitive and reliable both in periods of low and high flow. (See also W77-06708) (Bell-Cornell)
W78-07057

PENN STATE RUNOFF MODEL FOR THE ANALYSIS OF TIMING OF SUBWATERSHED RESPONSE TO STORMS,
Weston (Roy F.), Inc., West Chester, PA.
For primary bibliographic entry see Field 5G.
W78-07060

A NEW MULTIVARIATE GAMMA DISTRIBUTION AND ITS FITTING TO EMPIRICAL STREAMFLOW DATA,
Technical Univ. of Budapest (Hungary). Dept. of Mathematics.
A. Prekopa, and T. Szantai.
Water Resources Research, Vol. 14, No. 1, p 19-24, February 1978. 1 tab, 21 ref.

Descriptors: *Streamflow, *Model studies, *Mathematical models, Stochastic processes, Probability, Rivers, Streams, Equations, Mathematics, Statistics, Statistical models, Hydrology, *Gamma distributions.

A new multivariate gamma distribution was presented which can be fitted successfully to empirical data where the one-dimensional marginal distributions are gamma distributions with prescribed parameters and the correlations are nonnegative. It was not intended to give explicit formulae either for the joint density or for the joint characteristic function of the random variables. This representation of the individual gamme-distributed random variables was used for simulation, with the aid of which probabilities of sets in higher-dimensional spaces were approximated. Since streamflow and other hydrological data frequently follow gamma distribution and also they are frequently stochastically dependent, this multivariate distribution and fitting technique seemed to be of particular interest from the hydrological point of view. (Sims-ISWS)
W78-07089

COMPARISON OF THE TWO- AND THREE-PARAMETER LOG NORMAL DISTRIBUTIONS USED IN STREAMFLOW SYNTHESIS,
Stanford Univ., CA. Dept. of Civil Engineering.
R. J. Charbeneau.
Water Resources Research, Vol. 14, No. 1, p 149-150, February 1978. 5 ref.

Descriptors: *Streamflow, *Synthetic hydrology, *Model studies, *Mathematical models, Synthesis, Equations, Mathematics, Hydrology, Log normal models.

A direct solution was found for the algebraic system of equations relating the statistics of an observed flow sequence to those of the three-parameter log normal distribution. This solution can be used to compare the two- and three-parameter log normal distributions. (Sims-ISWS)
W78-07093

HISTORICAL STREAMFLOW SUMMARY, ALBERTA, TO 1976.
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 7C.
W78-07165

MATHEMATICAL MODELLING OF SEDIMENT-LADEN FLOWS IN NATURAL STREAMS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W78-07173

2F. Groundwater

QUARTERNARY EVOLUTION IN TAMA COUNTY, IOWA,
Queen's Univ., Kingston (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 2J.
W78-06827

GEOLOGICAL APPLICATIONS OF NIMBUS RADIATION DATA IN THE MIDDLE EAST,
National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center.
For primary bibliographic entry see Field 7B.
W78-06869

ESTIMATING TRANSMISSIVITY AND STORAGE COEFFICIENT FROM ABSTRACTION WELL DATA,
Birmingham Univ. (England). Dept. of Civil Engineering.
K. R. Rushton.
Ground Water, Vol. 16, No. 2, p 81-85, March-April 1978. 6 fig, 2 tab, 4 ref.

Descriptors: *Transmissivity, *Storage coefficient, *Well data, *Model studies, Mathematical models, Water wells, Water levels, Groundwater, Groundwater movement, Aquifers, Pumping, Drawdown, Recharge, Hydrology.

A numerical model for analyzing pumping tests was used to estimate the transmissivity and the storage coefficient from abstraction well-water levels measured during both the abstraction and recovery phases. The technique was applied to a practical test. In addition, an ideal test was devised, and the technique was used to give satisfactory estimates of the original parameters. (Sims-ISWS)
W78-06897

DEPENDENCE OF THE CHEMICAL COMPOSITION OF GROUND WATERS IN THE NORTHERN CAUCASUS ON THE COMPOSITION OF ENCLOSING ROCKS,
Gidrokhimicheskii Inst., Novocherkassk (USSR).
For primary bibliographic entry see Field 2K.
W78-06900

THE APPLICATION OF THE DIGITAL SIMULATION LANGUAGE PDEL TO SUBSURFACE HYDROLOGY PROBLEMS,
California Univ., Los Angeles. School of Engineering and Applied Science.
W. J. Karplus, and A. Cardenas.
Report UCLA-ENG-7432, April, 1974. 68 p, 24 fig, 3 tab, 21 ref, append. Jointly issued by California Water Resources Center as Report UCAL-WRC-W340. OWRT B-150-CAL(17). GK 31463:W340.

Descriptors: Digital computers, *Equations, *Computer programs, *Computer models, *Subsurface waters, Hydrology, *Aquifers, Aquifer characterisics, *Model studies, Water resources, Environment, *Groundwater, *Partial differential equation language(PDEL), Digital simulation, Computer languages.

PDEL, one of over 60 different problem-oriented higher-level languages designed specifically for system simulation, permits the digital computer programming of nonlinear elliptic, parabolic, hyperbolic, and biharmonic partial differential equations with only minimal programming knowledge. Results are summarized of efforts undertaken (from 1972 to 1974) to apply digital simulation techniques to subsurface hydrology problems, including modeling and solution of basic aquifer problems to investigate the utility and shortcomings of PDEL applications, and development of new models to facilitate the solution of parameter identification problems arising in water resources work. The philosophy and structure of PDEL is briefly explained, applications to hydrology are described, and current and future plans are described. Reprints of five published papers dealing with PDEL and related topics are presented in an appendix. (See also W75-08930) (Wares-IPA)
W78-06923

A THEORETICAL BASIS FOR EXPLORATION FOR NATIVE COPPER IN NORTHERN WISCONSIN,
Geological Survey, Reston, VA. Geology Div.
For primary bibliographic entry see Field 4B.
W78-06938

GROUND-WATER RESOURCES OF THE NORTH BEACH PENINSULA, PACIFIC COUNTY, WASHINGTON,
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-06941

THE USE OF TEMPERATURE LOGS TO TRACE THE MOVEMENT OF INJECTED WATER,
Geological Survey, Denver, CO. Water Resources Div.; and Geological Survey, Anchorage, AL. Water Resources Div.
W. S. Keys, and R. F. Brown.
Ground Water, Vol 16, No 1, p 32-48, January-February 1978. 8 fig, 3 tab, 11 ref.

Descriptors: *Tracking techniques, *Groundwater movement, *Injection wells, *Thermal water, *Tracers, Analytical techniques, Boreholes, Water temperature, Measurement, Logging(Recording), Aquifer characteristics, Evaluation, *Texas High Plains, *Ogallala aquifer.

Temperature logs were used to study the movement of water injected into wells penetrating the Pliocene Ogallala Formation in the High PLains of Texas. The water used for artificial recharge of the aquifer was derived from playa lakes in which the diurnal fluctuation of temperature was as much as 17 deg Celsius. Daily thermal cycles that resulted from injection of this water were traced through the aquifer by use of a series of temperature logs made at frequent intervals in cased holes specially constructed for logging. The thermal pulses were detected by logging holes as far as 46 meters (150 ft) from the recharge well. In areas where this technique was used, the Ogallala Formation consists of thick sections of uniform medium-grained sand that visually appear uniform and were thought to have uniform hydraulic conductivity. However, the results of temperature logging at each of the three test sites clearly demonstrate that the hydraulic conductivity varies greatly through these seemingly uniform lithologic units. Thermal pulse velocities were as high as 4.6 meters (15 ft) per hour in thin zones immediately adjacent to sand where velocities were a few feet per day. Tracing with temperature logs is potentially useful in locating zones of high intrinsic permeability and in detecting apparent changes in rate of flow as a function of time. (Woodard-USGS)

W78-06945

GEOCHEMISTRY,
Geological Survey, Reston, VA. Geologic Div.; and Geological Survey, Reston, VA. Water Resource Div.
For primary bibliographic entry see Field 2K.
W78-06946

REGIONAL GEOLOGY SERIES: PART III, UNGLACIATED APPALACHIAN REGION,
National Water Well Association, Worthington, OH.
J. A. Hunt.
Water Well Journal, Vol 32, No 4, p 42-43, April, 1978.

Descriptors: *Groundwater, *Aquifers, *Appalachian Mountain Region, Geology, Rotary drilling, Water wells, Water supply, Bedrock.

The Unglaciated Appalachian ground water region receives abundant rainfall and has rugged terrain composed primarily of hard rocks. The bedrock is covered by an extensive thick layer of weathered rock material. Although physiography varies significantly over the region, the hydrogeology is much the same throughout. Ground water occurs to considerable depth in bedrock joints or fractures, and in the loose and weathered surfical material. Aquifers in the region provide a good source for domestic wells, although such wells are frequently of rather low capacity. Municipal and industrial wells are not as numerous and are harder to locate than domestic supplies, but are still viable alternatives to surface water development. Air rotary drilling methods with downhole hammer are fast and efficient in these formations, and are constantly gaining in popularity. Few drilling problems are encountered in this area, and well development techniques are not normally used in hard rock. (See also W78-04291 and W78-05199) (Eberle-NWWA)
W78-06970

PUBLIC GROUNDWATER SUPPLIES IN EDWARDS COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W78-07085

AN APPROXIMATE DIFFERENTIAL EQUATION TO DESCRIBE LEAKY AQUIFER BEHAVIOR DURING INTERMEDIATE AND LARGE VALUES OF TIME,
Universidad Nacional Autonoma de Mexico, Mexico City. Dept. of Ingeniera.
L. Rodarte.
Water Resources Research, Vol. 14, No. 1, p 39-44, February 1978. 6 fig, 12 ref.

Descriptors: *Aquifers, *Groundwater, *Model studies, Mathematical models, Equations, Leakage, Flow, Pumping, Drawdown, Storage, Permeability, Water levels, Hydrology, *Leaky aquifers.

In analyzing a leaky aquifer for application in regional studies, it is of great interest to have available simplified mathematical representations from which an analogical or digital model of the problem can be constructed. In this paper, a differential equation valid for intermediate and large values of time was proposed. Also, an analytical solution corresponding to an isolated well as a test of the range of applicability of the proposed equation was obtained. (Sims-ISWS)
W78-07090

2G. Water In Soils

STABILITY CHARTS FOR SIMPLE EARTH SLOPES,
University of Tasmania, Hobart (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8D.
W78-06719

METHODS OF SOIL STABILIZATION FOR EROSION CONTROL,
Purdue Univ., Lafayette, IN. School of Civil Engineering.
For primary bibliographic entry see Field 4D.
W78-06724

SNOW BACKSCATTER IN THE 1-8 GHZ REGION,
Kansas Univ./Center for Research, Inc., Lawrence. Remote Sensing Lab.
For primary bibliographic entry see Field 2C.
W78-06731

REMARKS ON THE DETERMINATION OF THE UNSATURATED HYDRAULIC CONDUCTIVITY BASED ON FIELD MEASUREMENTS, (IN GERMAN),
W. Ehlers.
Z Pflanzenernaehr Bodenk 4, p 417-427, 1976.

Descriptors: *Hydraulic conductivity, Measurement, *Soil moisture, Loess, Error, *Moisture tension, Transpiration, Unsaturated soils, Winter wheat.

Hydraulic conductivity-moisture tension functions were previously evaluated by a field method for various layers of a fallow loess soil (grey brown podzolic soil). The magnitude of error when the hydraulic functions are calculated in the presence of transpiring plants is discussed. The error arises because the water uptake rates of roots are added to the capillary water flux through the soil matrix. With advancing growing stages of winter wheat and the increasing water extraction ability, the error becomes more pronounced. The conductivity values may then be over-estimated by a factor of half the power of 10 as compared to the results computed from the fallow soil.--Copyright 1977, Biological Abstracts, Inc.
W78-06774

EFFECT OF ROCK COMPOSITION AND STEEPNESS AND EXPOSURE OF SLOPES ON SURFACE AND UNDERGROUND RUNOFF (IN RUSSIAN),
Kislovodsk Mountain-Forest Lab. (USSR).
A. P. Kazankin.
Pochvovedenie 6, p 46-58, 1976.

Descriptors: *Subsurface runoff, *Soil erosion, *Leaching, Conglomerates, Forests, Leaching, Mountain, Phyllite, Quartzite, *Rocks, *Runoff, *Slopes(Steepness).

The runoff and leaching of erosion products on different soils are considered. Mountain-forest soils, underlain by large blocks of conglomerates, monolithic quartzites and phyllities, are characterized by a runoff which outcrops on slopes in places where rocks jut out. The conditions of stratal-fissure water elimination are absent and the vadose water, moving with accelerating velocity, erodes the thin soil layer. The highest resistance to erosion is demonstrated by soils formed on clay shales with strata dipping in the direction opposite to slope orientation.--Copyright 1977 Biological Abstracts, Inc.
W78-06781

DETERMINATION OF AMMONIUM N AND NITRATE N IN ACID PERMANGANATE SOLUTION USED TO ABSORB AMMONIA, NITRIC OXIDE, AND NITROGEN DIOXIDE EVOLVED FROM SOILS,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 5A.
W78-06828

SOIL MOISTURE GROUND TRUTH, STEAMBOAT SPRINGS, COLORADO, SITE, AND WALDEN, COLORADO, SITE, MARCH 8-10, 1976,
Bittinger (M.W.) and Associates, Inc., Fort Collins, CO.
E. B. Jones.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-25708. Price codes: A04 in paper copy, A01 in microfiche. Mission Report--March 8-10, 1976, April 1976. 51 p, 5 fig, 3 tab, 4 ref, 6 append.

Descriptors: *Soil moisture, *Remote sensing, *On-site data collections, *Colorado, Sampling, Measurement, Snow, Snowpacks, Snow surveys, Depth, Density, Vegetation, Aircraft, Surveys, Ground-truth data.

This report contained the ground-truth data taken at Steamboat Springs and Walden, Colorado, in support of the NASA mission in these areas during the period of March 8, 1976, through March 11, 1976. The Steamboat Springs site is located a few miles south of Steamboat Springs, Colorado. This line was approximately 4 miles (6.45 km) in length oriented in a generally north-south direction in the Yampa River Valley. Data taken on this primary line were as follows: (1) snow depths at intervals of 100 feet, (2) snow densities and water equivalents at intervals of 1000 feet, (3) snowpack characterizations at intervals of 1000 feet, and (4) snow pits for liquid water determinations and vertical layer classification at five selected locations. In addition to this primary line, six east-west transects of 1000 feet each were used for additional depth and density measurements. Two lines were sampled in the vicinity of Walden, Colorado. The first was the north-south line, approximately 4.5 miles (7.25 km) in length. The shorter east-west line was approximately 2.75 miles (4.5 km) in length. These lines were sampled much less intensively than was the Steamboat Springs line. The Walden lines were of a lesser snow depth than Steamboat Springs, and for much of the lines the vegetation was of a 'sagebrush type' which extended above the snowpack. The line at Steamboat Springs was generally located over flat meadowland, and all but riparian vegetation, excluding farmsteads, was totally snow covered. (Sims-ISWS)
W78-06870

THE PREDICTION OF UNFROZEN WATER CONTENTS IN FROZEN SOILS FROM LIQUID LIMIT DETERMINATIONS,
Cold Regions Research and Engineering Lab., Hanover, NH.
For primary bibliographic entry see Field 2C.
W78-06883

NUMERICAL STUDY OF QUASI-ANALYTIC AND FINITE DIFFERENCE SOLUTIONS OF THE SOIL-WATER TRANSFER EQUATION,
Department of Agriculture, Ottawa (Ontario).
H. N. Hayhoe.
Soil Science, Vol. 125, No. 2, p 68-74, February 1978. 3 fig, 3 tab, 9 ref.

Descriptors: *Infiltration, *Soil water movement, *Wetting, *Model studies, Mathematical models, Soil water, Moisture content, Analytical techniques, Equations, Soil science, Horizontal infiltration, Wetting fronts, Finite difference solutions.

The special case of horizontal infiltration of water into a dry soil was utilized to study the problem of

using standard finite differencing with an economic grid refinement to locate the wetting front accurately. The procedure used to determine an average value on grid subintervals for the strongly concentration-dependent soil-water diffusivity was identified as being a critical factor in accurately approximating the moisture profile. New averaging techniques were proposed which were shown to locate the steep front with significantly more accuracy. The exact solution was required as a basis for this study. To meet this need, a quasi-analytic technique was introduced and shown to be effective through numerical experiments and comparison with an alternative scheme. (Sims-ISWS)
W78-06887

THE USE OF DYNAMIC SOIL WATER CHARACTERISTICS IN A NUMERICAL DESORPTION MODEL,
Mississippi Agricultural and Forestry Experiment Station, Mississippi State.
K. K. Watson, and F. D. Whisler.
Soil Science, Vol. 125, No. 2, p 83-91, February 1978. 6 fig, 11 ref.

Descriptors: *Soil water, *Pressure head, *Soil water movement, *Model studies, Mathematical models, Moisture content, Soils, Porous media, Water table, Drainage, Hysteresis, Soil properties, Soil science, Hydrology, Desorption.

A numerical solution of the gravity drainage to a water table of an initially saturated column of porous material was used to examine the results of experimental studies where the volumetric water content (theta) during desorption was found to be dependent on both the soil water pressure head (h) and the rate of change of h with time (dh/dt). In keeping with the experimental findings, the h(theta) relationship was made space-dependent, and the water content and soil water pressure head profiles for this case were compared with the results obtained for two analyses in which the h(theta) relationship was held constant during drainage. These comparisons indicated that the water content profile is generally an insensitive measure of h(theta) variations. The relationship between h and dh/dt for specified theta values was determined from the space-dependent h(theta) analysis and compared with the shape of the curves reported in the experimental studies. (Sims-ISWS)
W78-06888

USE OF FERROUS HYDROXIDE FOR DETERMINATION OF NITRATE IN SOIL EXTRACTS,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 5A.
W78-06925

SOIL CHANGES AFTER HAY MEADOW ABANDONMENT IN SOUTHWESTERN WISCONSIN,
North Central Forest Experiment Station, St. Paul, MN.
For primary bibliographic entry see Field 4D.
W78-06978

MOVEMENT OF PESTICIDES IN THE SOIL WATER FERTILIZER SYSTEM,
Arkansas Univ., Fayetteville. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-06999

FEASIBILITY OF USING IRON ORE OVERBURDEN MATERIAL AS A MEDIA FOR DISPOSAL OF SECONDARY SEWAGE EFFLUENT IN NORTHEASTERN MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Forest Resources.
For primary bibliographic entry see Field 5E.
W78-07000

EFFECT OF DRAIN TUBE OPENINGS ON WATER-TABLE DRAWDOWN,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W78-07087

STUDY OF THE RELATIVE EFFICIENCY OF FINITE DIFFERENCE AND GALERKIN TECHNIQUES FOR MODELING SOIL-WATER TRANSFER,
Department of Agriculture, Ottawa (Ontario). Chemistry and Biology Research Inst.
H. N. Hayhoe.
Water Resources Research, Vol 14, No 1, p 97-102, February 1978. 8 fig, 2 tab, 14 ref.

Descriptors: *Infiltration, *Soil water, *Soil water movement, *Model studies, Mathematical models, Numerical analysis, Analytical technique, Moisture content, Soils, Soil science, Horizontal infiltration.

Horizontal infiltration of water into a dry soil was used to study the efficiency of finite difference and Galerkin procedures in accurately locating the steep wetting front. The location of the wetting front was determined by a quasi-analytic solution to Richard's equation. The Galerkin technique was evaluated by using linear, Hermite cubic, and Lagrange quintic elements. These schemes were compared with the performances of the Crank-Nicolson central difference method where a standard and a modified averaging procedure for soil-water diffusivity on grid subintervals is utilized. The comparisons were made on the basis of error as a function of spatial grid refinement and the relative efficiency in achieving a practical level of accuracy. The results lead to the conclusion that the Galerkin scheme with linear elements or the finite differencing scheme with the modified averaging procedure is preferable to the other techniques. (Sims-ISWS)
W78-07091

VARIABILITY OF HYDRAULIC CONDUCTIVITY WITHIN AND BETWEEN NINE WISCONSIN SOIL SERIES,
Wisconsin Univ.-Madison. Dept. of Soil Science.
F. G. Baker.
Water Resources Research, Vol. 14, No. 1, p 103-108, February 1978. 3 fig, 2 tab, 17 ref. EPA R802874.

Descriptors: *Hydraulic conductivity, *Moisture content, *Variability, *Soil types, Soil horizons, Infiltration, Soils, Soil water, Soil water movement, On-site data collections, Data processing, Soil properties, Soil science, *Wisconsin.

Hydraulic conductivity was measured in selected subsurface horizons of nine soil series by using the crust test method. Measurements were made for several moisture potentials in the range 0 to -150 cm of water at several randomly selected sites per soil series. The morphological character of the soil series spanned a broad range, from sands to clay loam soils. The hydraulic conductivity characteristic of each series was described mathematically and the series conductivity curves were related as a family of curves. By using multivariate discriminant analysis, the series were grouped into classes of similar hydraulic behavior, based on the dispersion of moisture potential and hydraulic conductivity data within and between series. A 95% prediction interval was constructed to include the range of conductivities to be expected at future sites. (Sims-ISWS)
W78-07092

LEAD IN SOILS AND PLANTS,
Colorado State Univ., Fort Collins. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 5B.
W78-07138

ANAEROBIC MICROBIAL COMMUNITY METABOLISM IN SPARTINA ALTERNIFLORA SOILS,
Georgia Univ., Athens. Dept. of Microbiology.
R. R. Christian, and W. J. Wiebe.
Limnology and Oceanography, Vol. 23, No. 2, p 328-336, March, 1978. 3 fig, 2 tab, 25 ref.

Descriptors: *Salt marshes, *Marine microorganisms, *Soil bacteria, *Anaerobic bacteria, Wetlands, Marshes, Tidal marshes, Grasses, Marsh plants, Microorganisms, Soil environment, Anaerobic digestion, Tidal effects, Spartina alterniflora.

The anaerobic uptake of C14 glucose was used as an index of potential microbial activity in the soils of a Spartina alterniflora salt marsh. The turnover times of glucose were consistently faster in the soils where tall S. alterniflora grew along a creek-bank than in the high marsh soils where s. alterniflora productivity was lower; this difference was magnified with increased depth. The distribution of label, followed through CO2, particulate, and ether-soluble fractions indicated rapid recycling in the soil of the tall S. alterniflora marsh. In an experiment designed to assess the effects of tidal inundation on the activity of the microbial community in the tall S. alterniflora marsh soils, no consistent changes in glucose uptake or ATP concentration were evident after 2 months of restricting water movement. No direct link of tidal inundation with the microbial community was obseved. (Steiner-Mass)
W78-07156

CHEMICAL COMPOSITION OF RAIN AND BROOK WATER IN BRITTANY (FRANCE), (IN FRENCH),
Rennes Univ. (France). Hydrobiological Lab.
For primary bibliographic entry see Field 2K.
W78-07192

2H. Lakes

ICE SHEET LOADS ON MARINA PILES,
Federal Highway Administration, Springfield, IL. Illinois Div.
For primary bibliographic entry see Field 8B.
W78-06715

REANALYSIS OF THE GREAT LAKES DROGUE STUDIES DATA,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
A. Okubo, C. C. Ebbesmeyer, J. M. Helseth, and A. S. Robbins.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 081. Price codes: A05 in paper copy, A01 in microfiche. Special Report 2, Reference 76-2, February 15, 1976. 84 p, 15 fig, 6 tab, 14 ref. NOAA 03-5-022-65.

Descriptors: *Lake Michigan, *Lake Erie, *Diffusion, *Turbulence, Analytical techniques, *On-site data collections, Water circulation, Dispersion, Statistics, Buoys, Methodology, Fluid mechanics, *Regression analysis, Advection, *Drogues, Lagrangian deformations.

During the summer of 1964, a series of field studies were conducted with the use of drogues or current followers in southern Lake Michigan and western Lake Erie. These data were edited and then processed using linear regression procedures to calculate Lagrangian deformations and velocity gradient parameters. These procedures allowed evaluation of turbulent characteristics. The results showed that the drogue area is controlled primarily by the cumulative effect of horizontal divergence, and that the turbulent characteristics generally are consistent with the previous estimates. Analytical solution of time-dependent advection-diffusion equation compared favorably with observed gross-

scale drogue dispersion. Gross-scale drogue groups revealed an average of five clusters per group. A statistical test showed that 10-15 drogues are required to achieve a standard deviation equal to the 95% confidence limit of the gross-scale drogue group. This can be used as a guideline for designing future dispersion experiments. (Singh-ISWS)
W78-06723

ACCUMULATION OF WATER SOLUBLE PHOSPHORUS AND HYDROLYSIS OF POLYPHOSPHATES BY CLADOPHERA GLOMERATA (CHLOROPHYCEAE),
Wisconsin Univ., Milwaukee. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-06747

FIFTH ANNUAL REPORT: GREAT LAKES WATER QUALITY.
International Joint Commission-United States and Canada.
For primary bibliographic entry see Field 5G.
W78-06762

SHORELINE ECOLOGY OF LAKE POWELL,
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
L. D. Potter, and N. B. Pattison.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 122, Price codes: A11 in paper copy, A01 in microfiche. Lake Powell Research Project Bulletin No 29, September 1976, Prepared for Research Applied to National Needs (RANN), National Science Foundation, (NSF-RA-760571), 238 p, 63 fig, 12 tab, 34 ref, append. GI-34840.

Descriptors: *Shores, *Shore protection, *Management, *Vegetation, *Aquatic vegetation, Shoreline cover, Soils, Sands, Soil properties, Terracing, Biomass, Reservoirs, Benthic flora, *Utah, Arizona, *Lake Powell(UT), *Benthic organisms, Tamarisk, Aquatic biology, Contaminants.

The study sets the biogeologic history of Lake Powell, Utah and discusses its conversion from river to reservoir. The lake's 1800 miles of shoreline are mapped by contour; also, the surface materials of the shoreline are categorized into seven major types and each type is assessed for its susceptibility to fluctuating water levels. Shoreline vegetation is investigated in terms of biomass and species composition with an eye toward weighing the use of selected shoreline vegetation versus terracing for shore protection during drawdown periods. Tamarisk is a principal species and a persistent invader; it is hardy and has a great variety of adaptations to overcome problems of a fluctuating shoreline. However, it rapidly becomes resistant to submergence mortality, and if allowed to develop without control, Tamarisk stands would change the chief recreational areas from highly desirable to highly undesirable. Because of the multiple disadvantages of Tamarisk, a method for shoreline management is recommended to protect the sandy shores for recreational use, involving a program of control in selected areas combined with supplementary plantings of more desirable shade species. (Zayac-NC)
W78-06773

A TOXONOMIC STUDY OF THE SPONGILLA ALBA, S. CENOTA, S. WAGNERI SPECIES GROUP (PORIFERA: SPONGILLIDAE) WITH ECOLOGICAL OBSERVATIONS OF S. ALBA,
New Orleans Univ., LA. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5A.
W78-06805

IMPROVING LAKE WATER QUALITY BY DESTRATIFICATION,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W78-06852

SALT REGIME OF RESERVOIRS, CHAPTER 6: ELEMENTARY HYDROBIOLOGICAL PROGNOSIS,
For primary bibliographic entry see Field 5C.
W78-06880

CONTRIBUTION TO THE PROBLEM OF FORECASTING THE MINERAL CONTENT AND CHEMICAL COMPOSITION OF RESERVOIR WATER,
Novocherkassk Inst. of Chemical Hydrology (USSR).
M. I. Kriventsov.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 658, Price codes: A03 in paper copy, A01 in microfiche. CRREL Draft Translation 610, March 1977. 25 p, 5 tab, 39 ref. Translated from Gidrokhimicheskiye Materialy, Vol. 45, p 89-106, 1967.

Descriptors: *Reservoirs, *Water quality, *Mineral water, *Model studies, Mathematical models, Chemical analysis, Chemicals, Dams, Lakes, Runoff, Erosion, Pollutants, Water pollution, Water chemistry, Minerals, Mineral content.

This article examined the problem of forecasting the mineral content and chemical composition of reservoir water, the problem of the magnitude of calculation errors when using various forecasting methods, and the tasks facing the forecasting of the chemical composition of reservoir water. (Sims-ISWS)
W78-06881

EFFECTS OF HYDROXAMIC ACIDS, IRON-SPECIFIC CHELATORS, ON THE GROWTH OF ALGAE,
Washington Univ., Seattle. Coll. of Seattle.
For primary bibliographic entry see Field 5C.
W78-06930

CONTRIBUTION OF REMOTE SENSING TO HABITAT EVALUATION AND MANAGEMENT IN A HIGHLY ALTERED ECOSYSTEM,
Great Dismal Swamp National Wildlife Refuge, Suffolk, VA.; and Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-06935

SATELLITE REMOTE SENSING STUDY OF THE TRANS-BOUNDARY MOVEMENT OF POLLUTANTS,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 5A.
W78-06979

STRUCTURAL COMPARISONS OF FOUR PLANT COMMUNITIES IN THE GREAT DISMAL SWAMP, VIRGINIA,
Old Dominion Univ., Norfolk, VA. Dept. of Biological Sciences.
For primary bibliographic entry see Field 2I.
W78-06988

SPRING WATERFOWL UTILIZATION OF WESTERN WISCONSIN WETLANDS,
Wisconsin Univ., River Falls. Dept. of Biology.
S. F. Goddard.
The Passenger Pigeon, Vol. 37, No. 1, p 32-44, 1975. 1 fig, 4 tab, 10 ref.

Descriptors: *Waterfowl, *Ducks, *Habitat, Wetlands, Mallard duck, Ring-necked duck, Blue-winged teal, Green-winged teal, Ponds, *Wisconsin, *Habitat preference, Spring duck use, Coot, St. Croix County(Wisc).

A four-year study on the use of western Wisconsin wetlands by waterfowl was carried out using 17 study ponds. During the study, 77,892 waterfowl representing 24 species were observed. Six species made up 85.7% of the total. These were Scaup (24.6%), coot (19.3%), ring-necked duck (14.8%), blue-winged teal (14.4%), mallard (8.0%) and green-winged teal (4.6%). Chi square analysis indicated a significant dependency between pond and total waterfowl use or use by species. Generally, larger ponds were used by larger numbers of birds; smaller ponds had the greatest use/acre. All six major species exhibited definite habitat preferences. Coots were the most selective species, followed by mallards, green-winged teal, scaup, ring-necks and blue-winged teal. (Stihler-Mass)
W78-06991

NESTING HABITAT OF CANADA GEESE IN SOUTHEASTERN MICHIGAN,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
R. M. Kaminski, and H. H. Prince.
Wilson Bulletin, Vol. 89, No. 4, p 523-531, December, 1977. 3 fig, 2 tab, 26 ref.

Descriptors: *Canada Goose, *Nesting, *Michigan, Wetlands, Vegetation, Islands, *Huron River Valley(Mich), Muskrat lodges.

Nesting habitat of Canada Geese in southeastern Michigan is described. Most nesting pairs (92%) preferred 2 or more hectares of open water. Data were collected from both muskrat lodges and islands used and not used as nesting sites. Discriminant function analysis was used to determine which factors best separated used from unused sites. Top width of muskrat lodges and percent slope of island relief along with the density of island vegetation were most important in the discrimination. (Stihler-Mass)
W78-06992

PRODUCTION PROCESSES UNDER THE ICE IN LAKE ST. CLAIR I. IRRADIATION AND TEMPERATURE,
Windsor Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-07039

PRODUCTION PROCESSES UNDER THE ICE IN LAKE ST. CLAIR II. NUTRIENTS (SILICATE) AS A LIMITING FACTOR,
Windsor Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-07040

SEASONAL GROWTH AND FOLIAR NUTRIENTS OF LARIX LARICINA IN THREE WETLAND ECOSYSTEMS,
Michigan Univ., Ann Arbor. Wetlands Ecosystem Research Group.
For primary bibliographic entry see Field 2I.
W78-07065

THE GENUS SPHAGNUM IN ALBERTA,
Alberta Univ., Edmonton. Dept. of Botany.
For primary bibliographic entry see Field 2I.
W78-07066

CHANGES IN THE VEGETATION OF A MOORLAND FISHPOND IN TWENTY-ONE YEARS,
Freshwater Biological Association, Ambleside (England).
For primary bibliographic entry see Field 2I.
W78-07067

OBSERVATIONS ON THE GROWTH OF SPHAGNUM CUSPIDATUM IN A BOG POOL ON THE SILVER FLOWE NATIONAL NATURE RESERVE,
Hull Univ. (England). Dept. of Plant Biology.
For primary bibliographic entry see Field 5C.
W78-07070

SECULAR WATER LEVEL FLUCTUATIONS IN THE LARGE NATURAL BODIES OF WATER OF KAZAKHSTAN AND SOVIET CENTRAL ASIA,
R. D. Kudrin.
Soviet Hydrology: Selected Papers, Vol. 15, No. 3, p 190-194, 1976. 3 fig, 1 tab, 17 ref. Translated from Trudy IV Vsesoyuznogo Gidrologicheskogo S'yezda, Vol. 5, p 98-107, 1975.

Descriptors: *Lakes, *Water level fluctuations, *Hydrologic budget, Data processing, Water levels, Fluctuations, Runoff, Discharge(Water), Evaporation, Geomorphology, Lake morphology, Groundwater, Climatic zones, Climatology, *USSR.

A comparison of lakes in the sufficiently wet zone of temperate latitudes with the lakes of the moisture-deficient zone of more southerly latitudes revealed significant differences in their water regimes because of the difference in their climatic conditions. The hydologic budget of the first zone is positive, i.e., precipitation depth exceeds evaporation depth and river runoff variations are small. The lakes are drained here, as a rule, which regulates their water level. The combination of relatively small climatic variations with the drainage of the lakes results in relatively small long peiod and secular water level fluctuations whose amplitude is comparable to that of intra-annual fluctuations. The hydrologic budget is negative in the second zone (with the exception of mountain regions), i.e., evaporation depth exceeds precipitation depth and river runoff variations are considerably greater, while the lakes are closed, as a rule, or occasionally draned. The combination of relatively strong variations of climatic elements with closed lakes produces a high amplitude of level fluctuations even in large bodies of water. The amplitude of secular fluctuations is one order of magnitude higher than that of intra-annual fluctuations. (Sims-ISWS)
W78-07114

APPLICATION OF LANDSAT SYSTEM FOR IMPROVING METHODOLOGY FOR INVENTORY AND CLASSIFICATION OF WETLANDS,
Fish and Wildlife Service, Jamestown, ND. Northern Prairie Wildlife Research Center.
For primary bibliographic entry see Field 7B.
W78-07143

USE OF LANDSAT DATA TO ASSESS WATERFOWL HABITAT QUALITY,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 7B.
W78-07147

THREE APPROACHES TO THE CLASSIFICATION AND MAPPING OF INLAND WETLANDS,
Geological Survey, Suffolk, VA.
For primary bibliographic entry see Field 7B.
W78-07154

THE AQUATIC MACROPHYTES OF SOME LAKES IN SOUTHEASTERN ONTARIO,
Queen's Univ., Kingston (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 2I.
W78-07161

THE DECOMPOSITION OF STANDING AND FALLEN LITTER OF TYPHA GLAUCA AND SCIRPUS FLUVIATILIS,
Iowa State Univ., Ames. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 5C.
W78-07162

WATERFOWL POPULATIONS AS RELATED TO HABITAT CHANGES IN BOG WETLANDS OF THE MOOSEHORN NATIONAL WILDLIFE REFUGE,
Maine Cooperative Wildlife Research Unit, Orono.
For primary bibliographic entry see Field 4A.
W78-07164

PROCESSES IN SEDIMENT DEPOSITION AND SHORELINE CHANGES IN THE POINT PELEE AREA, ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W78-07171

ALGAL NUTRIENT LIMITATION IN LAKE ONTARIO AND TRIBUTARY WATERS,
Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.
For primary bibliographic entry see Field 5C.
W78-07189

2I. Water In Plants

METHYLMERCURY: FORMATION IN PLANT TISSUES,
Environmental Protection Agency, Las Vegas, NV. Office of Research and Development.
For primary bibliographic entry see Field 5A.
W78-06753

WASTEWATER RECYCLING: DEVELOPMENT OF MYCORRHIZAL ROOT SYSTEMS FOR INCREASED EFFICIENCY,
Michigan State Univ., East Lansing. Dept. of Botany.
For primary bibliographic entry see Field 5G.
W78-06808

DRAINAGE MAP OF ARIZONA SHOWING PERENNIAL STREAMS AND SOME IMPORTANT WETLANDS,
Arizona Game and Fish Dept., Phoenix; and Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06950

MISSISSIPPI FLORA. IV. DICOTYLEDON FAMILIES WITH AQUATIC OR WETLAND SPECIES,
Georgia Univ., Athens. Dept. of Botany.
S. B. Jones, Jr.
Gulf Research Reports, Vol 5, No 1, p 7-22, 1975. 6 fig, 31 ref.

Descriptors: *Aquatic plants, *Mississippi, Wetlands, *Distribution, Habitats, *Classification, *Maps, *Dicotyledon families, Species keys.

Keys, distribution maps, habitats, references, nomenclature, and notes are given for some 12 families of dicotyledons occurring naturally or naturalized in Mississippi. These families contain one or more species which are found in aquatic or wetland habitats. They are: Bataceae, Callitrichaceae, Ceratophyllaceae, Elatinaceae, Haloragaceae, Hydrophyllaceae, Lentibulariaceae, Lythraceae, Nymphaeaceae, Podostemaceae, Polygonaceae, and Sururaceae. (Stihler-Mass)
W78-06985

GROWTH, MORTALITY, AND BIOMASS PARTITIONING IN FRESHWATER TIDAL WETLAND POPULATIONS OF WILD RICE (ZIZANIA AQUATICA VAR. AQUATICA),
Rider Coll., NJ. Dept. of Biology.
D. Whigham, and R. Simpson.
Bulletin of the Torrey Botanical Club, Vol 104, No 4, p 347-351, October-December, 1977. 2 fig, 1 tab, 21 ref.

Descriptors: *Tidal marshes, *Primary productivity, *Wild rice, *New Jersey, Delaware River, Coastal marshes, Rooted aquatic plants, Wetlands, Biomass, *Biomass partitioning(Aquatic plants), Seed production, Hamilton Marshes(NJ).

Eight populations of wild rice in the Hamilton Marshes were sampled from April into September. Net productivity was as high as 20.9 g/sq m/day and varied seasonally. Lowest production occurred during the seedling phenophase; highest followed seedling establishment. Most of the net primary production is used in shoot growth except during the seedling phenophase when a larger percentage of biomass is allocated to root development. Large numbers of seeds were produced (an estimated 37,300 seeds/sq m). Mortality was constant throughout the growing season. (Stihler-Mass)
W78-06986

NUTRIENT CYCLING IN A CAREX LACUSTRIS WETLAND,
Ithaca Coll., N.Y. Dept. of Biology.
J. M. Bernard, and B. A. Solsky.
Canadian Journal of Botany, Vol 55, No 6, p 630-638, 1977.

Descriptors: *Freshwater marshes, *Marsh plants, *Cycling nutrients, *Productivity, Wetlands, Aquatic plants, Nutrients, Nutrient requirements, Crop production, Plant growth, Potassium, Phosphorus, Nitrogen, Magnesium, Calcium, *Seasonal, Standing crops.

Seasonal changes in aboveground and belowground life history of the sedge, Carex lacustris, were determined and used to study primary production and nutrient cycling in the ecosystem. Seasonal aboveground production was estimated to be about 965 g/sq m per year, with a peak rate of 20.9 g/sq m per day reached in late July. Belowground production was estimated to be 208 g/sq m per year for a total production estimate of 1173 g/sq m per year. Nitrogen, phosphorus, and potassium begin the season with high percentage concentrations in green overwintering shoots but the percentages decline to only about one-third of the original at death in December, resulting in large losses of nutrients from the marsh into surrounding waters. Early growth in spring is characterized by a redistribution of the nutrients in the shoots, some translocation from belowground tissues, and uptake from the soil. Calcium and magnesium do not show any important translocation patterns during the year. The yearly budget of uptake and loss of nutrients during a year is estimated to be 15.9 g/sq m nitrogen, 1.9 g/sq m phosphorus, 16.6 g/sq m potassium, 2.9 g/sq m calcium, and 1.5 g/sq m magnesium. (Steiner-Mass)
W78-06987

STRUCTURAL COMPARISONS OF FOUR PLANT COMMUNITIES IN THE GREAT DISMAL SWAMP, VIRGINIA,
Old Dominion Univ., Norfolk, VA. Dept. of Biological Sciences.
C. V. Dabel, and F. P. Day, Jr.
Bulletin of the Torrey Botanical Club, Vol 104, No 4, p 352-360, 8 tab, 28 ref. Oct-Dec 1977.

Descriptors: *Swamps, *Biomass, Wetlands, White-cedar trees, Oak trees, *Virginia, *Great

Dismal Swamp(Va), *Plant communities, *Shrub biomass, *Species richness, Black gum trees, Water gum trees, Red maple trees, Bald cypress trees, Mixed hardwoods type.

Series of nested quadrats were used to measure vegetation on four sites, each representing a different community type. The four types and dominant species in each (by biomass and basal area) are: (1) Cedar--Atlantic white cedar and black gum, (2) Maple-gum--water gum and red maple, (3) Cypress--bald cypress, (4) Mixed hardwoods--laurel and white oak. Total biomass for the cedar, maple-gum, and mixed hardwoods communities (comprising 70% of the vegetation of the swamp) was approximately 200,000 kg/ha; that for cypress, comprising only 2% of the vegetation of Dismal Swamp, was 345,300 kg/ha. The cedar site had the largest shrub biomass; cypress had the least. Species richness was low at each site as calculated for the tree strata. Richness was highest at the mixed hardwood site and lowest at the maple-gum site. (Stihler-Mass)
W78-06988

BEACH PHYTOMASS ALONG THE CALIFORNIA COAST,
California Univ., Davis. Dept. of Botany.
M. G. Barbour, and R. H. Robichaux.
Bulletin of the Torrey Botanical Club, Vol. 103, No. 1, p 16-20. 1 fig, 2 tab, 13 ref. Jan-Feb 1976.

Descriptors: *Beaches, *Biomass, *Primary productivity, *Aquatic plants, *California, Pacific Coast region, Wetlands, *Community biomass, Cover:weight curves, Latitudinal changes.

Above-ground plant community biomass was determined for 19 representative beaches scattered along the California coast. Community biomass was determined indirectly by extrapolating from cover:weight curves for each species to transect data showing average cover by species for a 40-100-m-wide portion of the beach. Regressions showed that weight was linearly related to cover and, for most species, was not affected by latitudinal gradients in macroclimate. Some species such as Ambrosia chamissonis ssp. bipinnatisecta, however, exhibited up to 3-fold changes with latitude. Average community biomass was highly viable from beach to beach, reflecting the dominant species. It ranged from 20 to 395 g dry wt.sq m. (Stihler-Mass)
W78-06989

NESTING BEHAVIOR OF HERRING GULLS: INVASION INTO SPARTINA SALT MARSH AREAS OF NEW JERSEY,
Livingston Coll., New Brunswick, NJ. Dept. of Biology.
For primary bibliographic entry see Field 2L.
W78-06990

SPRING WATERFOWL UTILIZATION OF WESTERN WISCONSIN WETLANDS,
Wisconsin Univ., River Falls. Dept. of Biology.
For primary bibliographic entry see Field 2H.
W78-06991

NESTING HABITAT OF CANADA GEESE IN SOUTHEASTERN MICHIGAN,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 2H.
W78-06992

A STUDY OF THE COMMON REEDGRASS (PHRAGMITES COMMUNIS TRIN.) IN THE COASTAL ZONE OF DELAWARE,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 2L.
W78-06993

THE UPTAKE OF BORON BY LEMNA MINOR,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W78-07027

A MANUAL OF MARSH AND AQUATIC VASCULAR PLANTS OF NORTH CAROLINA WITH HABITAT DATA,
North Carolina Agricultural Experiment Station, Raleigh.
E. O. Beal.
Technical Bulletin No. 247, 1977. 298 p. 4 fig, 34 ref.

Descriptors: *Aquatic plants, *North Carolina, Rooted aquatic plants, Ecological distribution, Habitats, Hydrogen ion concentration, Specific conductivity, Wetlands, Marshes, Keys, Chloride content, Organic matter content.

Plants from 76 families are presented including some species which occur in, but are not limited to, marshy areas. Many, but not all, species occurring in North Carolina are included. Two basic keys are provided: a key to all marsh and aquatic families and/or genera known to occur in North Carolina, and a restricted key to plants of brackish water, salt marshes, and marine areas. Specific keys to genera within families and species within genera are also provided. Species are represented by line drawings, comments on distribution in North Carolina and the contiguous United States. Where appropriate, comments on taxonomic treatment are included. Habitat data, in terms of pH, chloride content, organic matter content, and specific conductance of the water, is presented by bar graphs where original data are available. (Stihler-Mass)
W78-07062

PRODUCTION AND ECOLOGY OF EELGRASS (ZOSTERA MARINA L.) IN GREVELINGEN ESTUARY, THE NETHERLANDS, BEFORE AND AFTER THE CLOSURE,
Delta Inst. for Hydrobiological Research, Yerseke (Netherlands).
P. H. Nienhuis, and B. H. H. De Bree.
Hydrobiologia, Vol. 52, No. 1, p 55-66, 1977. 9 fig, 1 tab, 26 ref.

Descriptors: *Primary productivity, Distribution, *Eelgrass, Aboveground production, Belowground production, *Grevelingen Estuary(The Netherlands), Water transparency, Stagnant salt-water lake, Closure.

In 1971 Grevelingen Estuary was cut off from the North Sea and the influence of the Rhine River by a dam and became a stagnant salt-water lake. After closure eelgrass populations extended downward to 5 m below lake level, probably a result of increased water transparency. Annual aboveground production in eelgrass beds, based on doubled maximum standing crop in July-August, was estimated at 50 g C/sq m in 1968 and 121 g C/sq m in 1973 and 91 g C/sq m in 1975. A minimum estimate of net production in eelgrass beds at a depth of 0.50 to 0.75 m, based on short-term changes in biomass in two permanent quadrats, was 40.5 g C/sq m/yr for aboveground and 12.7 g C/sq m/yr for belowground parts. Horizontal distribution of eelgrass was limited mainly by exposure to wave action and currents. The largest proportion of eelgrass production apparently enters detritus food chains. (Stihler-Mass)
W78-07063

HABITAT, MORPHOLOGY AND PHENOLOGY OF SOUTHERN WILD RICE (ZIZANIA AQUATICA L.) FROM THE WADING RIVER IN NEW JERSEY,
Academy of Natural Sciences of Philadelphia, PA. Dept. of Botany.
W. R. Ferren, Jr., and R. E. Good.
Bulletin of the Torrey Botanical Club, Vol. 104, No. 4, p 392-396, October-December, 1977. 2 fig, 8 ref.

Descriptors: *Wild rice, *Habitats, *Ecotypes, Plant morphology, Coastal marshes, Wetlands, Estuaries, New Jersey, *Wading River(New Jersey).

A unique population of southern wild rice, perhaps an ecotype, is described from the estuary of the Wading River. Individuals of this population grow below low tide in shallow protected areas and broad, slip-off slopes of river meanders on substrates of mud or soft, black muck. Wading River plants have decumbent stems which root at the lower 3 to 6 nodes, 2 to 6 branches with axillary panicles on the upper nodes, unusually narrow submerged, floating, and aerial leaves, and emergent inflorescences which bear pistillate florets with long lemma awns averaging 6.5 cm. These plants flower, produce mature grain, and shatter over a longer period later in the fall than do plants of other New Jersey populations. (Stihler-Mass)
W78-07064

SEASONAL GROWTH AND FOLIAR NUTRIENTS OF LARIX LARICINA IN THREE WETLAND ECOSYSTEMS,
Michigan Univ., Ann Arbor. Wetlands Ecosystem Research Group.
D. L. Tilton.
Canadian Journal of Botany, Vol. 55, No. 10, p 1291-1298, 1977. 3 fig, 4 tab, 38 ref.

Descriptors: *Wetlands, *Leaves, *Plant growth, *Nutrient requirements, Bogs, Fens, Swamps, Growth rates, Foliar, Seasonal, Nutrients, Plant physiology, Inorganic compounds, Trees, Deciduous trees, Phosphorus, *Tamarack, Conifer swamps, Needles, Lateral shoots, *Larix laricina.

Nutrient levels were determined in foliage from tamarack in a bog, conifer swamp, and fen from budbreak to leaf abscission. Elongation of needles and shoots ceased at similar dates for all sites, but trees in the fen had significantly longer needles and lateral shoots. At the time of complete leaf and shoot development, foliar concentrations of N, Ca, and Mg were higher in the fen than in the conifer swamp or bog, while concentrations of Al, Fe, Zn, Mn, and B were higher in the bog than the other two sites. Phosphorus concentrations in foliage were similar in the fen and conifer swamp but were lower in the bog site. Despite significant between-site variation for certain foliar elements, two patterns of seasonal variation were discerned. Significant between-site differences in the amounts and rates of needle and shoot elongation, foliar nutrient concentrations, and patterns of certain foliar elements were associated with variations in nutrient status and moisture-aeration conditions of the study sites. (Steiner-Mass)
W78-07065

THE GENUS SPHAGNUM IN ALBERTA,
Alberta Univ., Edmonton. Dept. of Botany.
D. H. Vitt, and R. E. Andrus.
Canadian Journal of Botany, Vol. 55, No. 3, p 331-357, 1977. 67 fig, 3 tab, 24 ref.

Descriptors: *Fens, *Mosses, *Systematics, *Distribution patterns, Wetlands, Bogs, Aquatic plants, Classification, Speciation, Environmental gradient, Aquatic habitats, Niches, *Sphagnum, *Alberta(Canada), Geographical distribution.

Wetland plant communities in which Sphagnum species are common or are the dominant bryophytes occur on about one-quarter to one-third of the landscape occupied by coniferous forests. A multiple-access key and an illustrated, dichotomous key are given for the species, and the habitat and distribution of each species in Alberta are presented. In most areas, Sphagnum forms the most conspicuous part of the lowland ground

cover, particularly in regions of mineral poor fens to fens transitional to mineral rich fens. Sphagnum is of great importance because of its ability to retard decomposition, acidify its surroundings, and hold large quantities of water. The species of Sphagnum that occur in the province have either widespread of continental tendencies in their distribution patterns. Oceanic and suboceanic species are absent from the flora. (Steiner-Mass)
W78-07066

CHANGES IN THE VEGETATION OF A MOORLAND FISHPOND IN TWENTY-ONE YEARS,
Freshwater Biological Association, Ambleside (England).
T. T. Macan.
Journal of Ecology, Vol. 65, p 95-106, 1977. 3 fig, 2 tab, 7 ref.

Descriptors: *Rooted aquatic plants, *Vegetation regrowth, Ecological distribution, Limiting factors, Wetlands, Aquatic plants, Submerged plants, Pondweeds, *Vegetation effects, Fluctuation, Aquatic habitats, Distribution patterns, Environmental effects, Lakes, Ponds.

Vegetative change has been a feature of Hodson's Tarn for many years, but there has not been a progressive seral change. There have been marked fluctuations in the abundance of the three most frequent species (Myriophyllum alterniflorum, Littorella uniflora, Carex rostrata). M. alterniflorum, after decline and recovery, has disappeared as a continuous stand. Other less frequent species have changed position (Potamogeton natans), fluctuated in abundance (Juncus fluitans, Nitella flexilis), disappeared (Alisma plantago-aquatica, Glyceria fluitans), or invaded and expanded (Potamogeton alpinus). It is likely that the vegetative changes were caused by changes in the substratum. The stand of Myriophyllum at the start was due to the exceptional condition that the soil had been exposed to the air a few years previously. Erosion or decomposition of lacustrine deposits during the dry period had rendered the soil favorable, but it gradually became unfavorable as the deposits accumulated once more. The decline of Carex and Littorella and the changes in abundance of Juncus fluitans and Nitella may be attributed to some unfavorable factor in the soil as vegetable remains accumulated. The vegetation declined, the plant remains decomposed, and the soil gradually became suitable for the return of vegetation. (Steiner-Mass)
W78-07067

EFFECTS OF GRASS CARP INTRODUCTION ON WATERFOWL HABITAT,
Florida State Game and Fresh Water Fish Commission, Lake Wales.
For primary bibliographic entry see Field 6G.
W78-07068

TIDAL WETLAND PLANTS OF VIRGINIA,
Virginia Inst. of Marine Science, Gloucester Point.
G. M. Silberhorn.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-260 837, Price codes: A05 in paper copy, A01 in microfiche. Educational Series No. 19, April, 1976. 90 p.

Descriptors: *Rooted aquatic plants, *Virginia, *Coastal marshes, Wetlands, Cattails, Bulrushes, Grasses, Woody plants, Sedges, Key to plant species.

A descriptive key to and description of the common tidal flora of Virginia is presented. A description of individual species (including distinguishing characteristics and habitat) is accompanied by an appropriate illustration. Species are divided into four groups: 1. Grass and grasslike plants, 2. Plants with minute, inconspicuous flowers, 3. Woody plants, and 4. Plants with conspicuous or pod-like inflorescences. (Stihler-Mass)
W78-07072

SALT MARSH CULICOIDES (DIPTERA: CERATOPOGONIDAE): SPECIES, SEASONAL ABUNDANCE AND COMPARISONS OF TRAPPING METHODS,
North Carolina Agriculture Experiment Stations, Raleigh.
D. L. Kline, and R. C. Axtell.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 077, Price codes: A02 in paper copy, A01 in microfiche. Mosquito News, Vol. 36, No. 1, p 1-10, March, 1976. 2 fig, 2 tab, 36 ref.

Descriptors: *Diptera, *Coastal marshes, *North Carolina, Trapping, *Biting gnats, *Seasonal variations, Culicoides, Trapping methods.

The spatial and seasonal abundance of adult biting gnats in a coastal Spartina salt marsh in North Carolina was determined during a 2-year period using a light trap, emergence traps, and sticky cylinder traps. Twelve species were collected, the greatest number (11) by the light trap. Culicoides hollensis and C. furens were the most abundant species. C. hollensis was abundant in spring and fall; C. furens, from later spring to early fall. Emergence traps provided the most precise data on seasonal occurrence of both species. The light trap and sticky cylinder traps were less effective in attracting C. hollensis than C. furens. With these two trap types a lower percentage of males of both species was obtained, than was obtained using emergence traps. Adult catches were correlated with temperature, rainfall, and the percentage of time the marsh was flooded. (Stihler-Mass)
W78-07074

PLANT SPECIES CHECKLIST FOR THE LAC DES ALLEMANDS SWAMP AREA OF LOUISIANA,
Louisiana State Univ., Baton Rouge. School of Forestry and Wildlife Management.
W. H. Conner, R. E. Noble, and S. W. Day, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 078, Price codes: A02 in paper copy, A01 in microfiche. Agricultural Experiment Station Research Release, Note No. 113, July, 1975. 5 p, 8 ref.

Descriptors: *Swamps, *Louisiana, *Aquatic plants, *Census, Wetlands, Marsh plants, Data collections, Surveys, Lac Des Allemands Swamp(Louisiana), Checklist.

The compilation of a checklist of plants found in the area was one aspect of a study of productivity and plant composition in the freshwater swamp system. The list is composed of those plants personally observed by the authors. Within the swamp, two forest types--bottomland hardwood and baldcypress-water tupelo--were studied. In the bottomland hardwood area, Drummond red maple, boxelder, roughleaf dogwood, and black willow dominate with only a few baldcypress and water tupelo. In the swamp areas, however, baldcypress and water tupelo dominate with only a few Drummond red maples and pumpkin ashes present. (Steiner-Mass)
W78-07144

A TECHNIQUE FOR THE DETERMINATION OF LOUISIANA MARSH SALINITY ZONES FROM VEGETATION MAPPED BY MULTISPECTRAL SCANNER DATA: A COMPARISON OF SATELLITE AND AIRCRAFT DATA,
National Aeronautics and Space Administration, Houston, TX.
For primary bibliographic entry see Field 7B.
W78-07148

REMOTE SENSING OF AQUATIC PLANTS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 7B.
W78-07153

THREE APPROACHES TO THE CLASSIFICATION AND MAPPING OF INLAND WETLANDS,
Geological Survey, Suffolk, VA.
For primary bibliographic entry see Field 7B.
W78-07154

VEGETATION ON ROCKY SHORES AT SOME NORTH IRISH SEA SITES,
Liverpool Univ. (England). Hartley Botanical Labs.
For primary bibliographic entry see Field 5C.
W78-07155

NITROGEN FIXATION BY ALGAE IN A MASSACHUSETTS SALT MARSH,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 2L.
W78-07157

THE AQUATIC MACROPHYTES OF SOME LAKES IN SOUTHEASTERN ONTARIO,
Queen's Univ., Kingston (Ontario). Dept. of Biology.
A. A. Crowder, J. M. Bristow, M. R. King, and S. Vanderkloet.
Le Naturaliste Canadien, Vol. 104, p 457-464, 1977. 1 fig, 2 tab, 13 ref.

Descriptors: *Aquatic plants, *Census, *Distribution patterns, Wetlands, Lakes, Rooted aquatic plants, Submerged plants, Floating plants, Aquatic habitats, Canada, Southeastern Ontario.

Results of a survey of the submerged aquatic macrophytes in 16 sites in southeastern Ontario varying widely in geology and nutrient status are presented. When comparisons could be made, the majority of the submerged and floating-leaved aquatic macrophyte found showed similar distribution patterns in relation to water conductivity as these same species growing in other parts of North America or in Europe. (Steiner-Mass)
W78-07161

OUR DYNAMIC TIDAL MARSHES: VEGETATION CHANGES AS REVEALED BY PEAT ANALYSIS,
Connecticut Coll., New London.
For primary bibliographic entry see Field 2L.
W78-07163

2J. Erosion and Sedimentation

EROSION RATES OF COHESIVE SOILS,
Nielsen Engineering and Research Inc., Mountain View, CA.
R. Ariathurai, and K. Arulanandan.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 104, No HY2, Technical Notes, p 279-283, February 1978. 5 fig, 4 ref, 1 append.

Descriptors: *Erosion rates, *Cohesive soils, *Laboratory tests, Erosion, Soils, Shear stress, Clays, Soil types, Cation exchange, Loam, Illitic, Temperature, Chemical properties, Mechanical properties, Expansive soils, Testing procedures, Yolo loam, Sodium adsorption ratio.

The objective was to describe the effects of the principal physical and chemical factors on the rate of erosion of saturated cohesive soils. A number of remolded samples with different types and amounts of clay and different pore fluid compositions were preconsolidated in a 7.6-cm diam cylindrical tube at a normal stress of 1 kg/sq cm. After consolidation, the samples were placed in the eroding fluid to be used and were allowed to swell for a few hours. The results of erosion tests on over 200 natural and made-up soil samples indicated that the erosion rate constant, M, lies in

the range 0.003 g/sq cm x min to 0.03 g/sq cm x min with few exceptions. The slopes, of the erosion rate curves increases with increase in critical shear stress. If the relationship between s and critical shear stress were inverse, then M would be independent of the critical shear stress, although M may vary with other chemical and physical parameters. If further measurements designed to investigate the relationship between the erodibility constants critical shear stress and M should yield a functional relationship between the two, there will be one less parameter to deal with in problems such as the determination of soil yield from watersheds, and estuarial sediment transport. (Humphreys-ISWS)
W78-06720

REANALYSIS OF THE GREAT LAKES DROGUE STUDIES DATA,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 2H.
W78-06723

METHODS OF SOIL STABILIZATION FOR EROSION CONTROL,
Purdue Univ., Lafayette, IN. School of Civil Engineering.
For primary bibliographic entry see Field 4D.
W78-06724

EFFECT OF ROCK COMPOSITION AND STEEPNESS AND EXPOSURE OF SLOPES ON SURFACE AND UNDERGROUND RUNOFF (IN RUSSIAN),
Kislovodsk Mountain-Forest Lab. (USSR).
For primary bibliographic entry see Field 2G.
W78-06781

URBAN CHANNEL EROSION: PRELIMINARY ANALYSIS,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 4D.
W78-06810

QUARTERNARY EVOLUTION IN TAMA COUNTY, IOWA,
Queen's Univ., Kingston (Ontario). Dept. of Geography.
W. J. Vreeken.
Annals of the Association of American Geographers, Vol 65, No 2, p 283-296, June, 1975. 13 fig, 13 ref. OWRT A-999-IA(11).

Descriptors: *Geomorphology, *Gullies, *Loess, *Paleosols, *Iowa, *Stratigraphy, *Erosion, Interglacial periods, Paha, Stoneline, Land evolution.

The geomorphic history of two fingertip drainage basins in northeast Iowa was reconstructed from borehole observations. A multicyclic land surface (a residual upland with Yarmouth-Sangamon paleosols on Kansan till, a lower erosion surface with late Sangamon palesosols, and still lower Iowan erosion surfaces in till without palesols) is cloaked by Wisconsin loess. The upper two of these three levels were buried about 29,000 years B.P. Successively lower protions of the Iowan surfaces are overlain by successively younger subdivisions of the loess, indicating time-trangressive burial owing to continuing erosion. Burial was completed around 18,300 years B.P. Locally thick loess on top of the Iowan surfaces is indicative of spatially different rates of deposition. Iowan surfaces served as the source of sand in the loess. Modifications since the close of loess deposition around 14,000 years B.P. were inferred from valley fills. They include a major gully cycle with terminated around 6,200 years B.P., followed by massive sheet erosion. Anthropogenic influences after white settlement are evidenced by an uppermost increment of valley fill that is locally breached by discontinuous gullies. (Seip - IPA)
W78-06827

BYPASSING SAND AT COASTAL INLETS.
For primary bibliographic entry see Field 2L.
W78-06891

CONTROL OF TURBIDITY AT CONSTRUCTION SITES.
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 5G.
W78-06904

STOCHASTIC ANALYSIS OF PARTICLE MOVEMENT OVER A DUNE BED,
Geological Survey, Bay St. Louis, MS. Water Resources Div.
B. K. Lee, and H. E. Jobson.
Available from Supt. of Documents, GPO, Washington, DC 20402, price $2.50. Professional Paper 1040, 1977. 72 p, 20 fig, 75 tab, 14 ref.

Descriptors: *Sediment transport, *Particle size, *Model studies, *Alluvial channels, *Stochastic processes, Streamflow, Analytical techniques, Equations, Dune sands, Sediments, River dune bed.

Stochastic models are available that can be used to predict the transport and dispersion of bed-material sediment particles in an alluvial channel. These models are based on the proposition that the movement of a single bed-material sediment particle consists of a series of steps of random length separated by rest periods of random duration and, therefore, application of the models requires a knowledge of the probability distributions of the step lengths, the rest periods, the elevation of particle deposition, and the elevation of particle erosion. The procedure was tested by determining distributions from bed profiles formed in a large laboratory flume with a coarse sand as the bed material. The elevation of particle deposition and the elevation of particle erosion can be considered to be identically distributed, and their distribution can be described by either a 'truncated Gaussian' or a 'triangular' density function. The conditional probability distribution of the rest period given the elevation of particle deposition closely followed the two-parameter gamma distribution. The conditional probability distribution of the step length given the elevation of particle erosion and the elevation of particle deposition also closely followed the two-parameter gamma density function. For a given flow, the scale and shape parameters describing the gamma probability distributions can be expressed as functions of bed-elevation. (Woodard-USGS)
W78-06948

EROSION AND SEDIMENT YIELDS IN THE TRANSVERSE RANGES, SOUTHERN CALIFORNIA,
Geological Survey, Laguna Niguel, CA. Water Resources Div.
K. M. Scott, and R. P. Williams.
Available from Supt of Documents, GPO, Washington, DC 20402, price $1.70. Professional Paper 1030, 1978, 38 p, 12 fig, 8 tab, 54 ref.

Descriptors: *Erosion rates, *Sediment yield, *Storms, *California, Mountains, Watersheds(Basins), Landslides, Uplift pressure, Forecasting, Equations, Analytical techniques, *Ventura County(Calif), Transverse ranges.

Major-storm and long-term erosion rates in mountain watersheds of the western Transverse Ranges of Ventura County, Calif., are estimated to range from low values that would not require the construction of catchments or channel-stabilization structures to values as high as those recorded anywhere for comparable bedrock erodibilities. A major reason for this extreme variability is the high degree of tectonic activity in the area--watersheds are locally being uplifted by at least as much as 25 feet per 1,000 years, yet the maximum extrapolated rate of denudation measured over the longest available period of record is 7.5 feet per 1,000 years adjusted to a drainage area of 0.5 square mile. Evidence of large amounts of uplift continuing into historic time includes structurally overturned strata of Pleistocene age, active thrust faulting, demonstrable stream antecedence, uplifted and deformed terraces, and other results of base-level change seen in stream channels. Such evidence is widespread in the Transverse Ranges, and aspects of the landscape are locally more a function of tectonic activity than of the denudational process. (Woodard-USGS)
W78-06949

AN EVALUATION OF THE USE OF REDOX MEASUREMENTS FOR CHARACTERIZING RECENT SEDIMENTS,
Stockholm Univ. (Sweden). Dept. of Geology.
L. E. Bagander, and L. Niemistro.
Estuarine and Coastal Marine Science, Vol. 6, No. 2, p 127-134, February 1978. 7 fig, 15 ref.

Descriptors: *Sediments, *Oxidation-reduction potential, *Cores, Sampling, Analytical techniques, Electrodes, Laboratory tests, Analysis, Regression analysis, Profiles, Depth, Sedimentation, Sedimentology, *Baltic Sea, *Gulf of Bothnia.

Redox measurements, in sediment cores from 17 stations in the Baltic Sea and the Gulf of Bothnia, were carried out in order to compare the results from two separate pieces of equipment for measuring. Linear regression analysis of the results from 107 parallel measurements gave a coefficient of correlation of 0.98. The measured redox values were grouped into three distinct clusters which reflected the predominance of a 'strong' redox couple or couples within each of these redox ranges. The good correlation between the results indicated that redox measurements can be made with reasonable reproducibility. (Sims-ISWS)
W78-07098

MEASUREMENT OF 239 - 240 PU IN THE NORTHWESTERN MEDITERRANEAN,
International Lab. of Marine Radioactivity.
For primary bibliographic entry see Field 2L.
W78-07099

SOIL DISTRUBANCE CAUSED BY SKYLINE CABLE LOGGING ON STEEP SLOPES IN WEST VIRGINIA,
Northeastern Forest Experiment Station, Parson, WV. Timber and Watershed Lab.
For primary bibliographic entry see Field 4C.
W78-07109

GEOGRAPHIC INVESTIGATIONS OF SNOW AVALANCHES AND MUDFLOWS,
Moscow State Univ., Moscow (USSR). Lab. of Snow Avalanche and Mudflow Problems.
For primary bibliographic entry see Field 2C.
W78-07117

DEPOSITIONAL ENVIRONMENTS IN THE COLVILLE RIVER DELTA,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 2L.
W78-07149

PROCESSES IN SEDIMENT DEPOSITION AND SHORELINE CHANGES IN THE POINT PELEE AREA, ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario).
J. P. Coakley.

Scientific Series No. 79, 1977, 76 p, 26 fig, 40 ref, 9 tab.

Descriptors: *Sediment transport, *Beach erosion, *Littoral drift, Shoals, Shores, Currents(Water), Circulation, Seiches, Waves(Water), Sedimentology, Dredging, *Canada, Lake Erie, Lake sediments, *Point Pelee(Ontario).

Ever since its formation as a much larger coastal feature some 4000 years ago, Point Pelee has been receding landward (i.e. northward and westward) under the influence of rising lake levels and increasing wave stress. Using some reasonable assumptions, we estimate the average rate of retreat since that time as being in the order of 2.5 m per yr (northward) and 0.25 m per yr (westward). More recent trends inferred from the historical record (reports, surveys and charts) indicate significant change from this overall trend. Average westward recession since 1918 for large portions of the east side of the Point now reaches more than 3 m per yr, and the partially submerged spit south of the Point has been greatly reduced in length. At the same time, however, some areas have remained stable or show a degree of accession over this period. Short-term monitoring of bottom currents in the area are for the most part consistent with the above sediment dispersal patterns, but the energy spectra of the currents suggest that agents such as lake circulation effects (especially those related to seiching) are of greater importance than waves in sediment distribution patterns on the shoal. On the basis of the above information, it is concluded that there is little evidence that commercial dredging in the southernmost areas of the shoal is an important factor in shoreline changes on the Point. However, the dredging operations in the vicinity of the spit itself during the early 1900's, and the proximity of more recent operations (until 1973) to the postulated storage area in the northern areas of the shoal should definitely be considered as adverse factors in explaining the recent trends in shoreline changes at Point Pelee. (WATDOC)
W78-07171

MATHEMATICAL MODELLING OF SEDIMENT-LADEN FLOWS IN NATURAL STREAMS,
Canada Centre for Inland Waters, Burlington (Ontario).
B. G. Krishnappan, and N. Snider.
Scientific Series No. 81, 1977, 48 p, 8 fig, 13 ref, append.

Descriptors: *Sediment transport, *Flow, *Unsteady flow, *Natural flow, Streams, Streamflow, *Mathematical models, Laboratory tests, Momentum, Friction, Equation, Momentum transfer, Velocity, Continuous flow, Upstream, Downstream, *Hypothetical river, *Alluvial streams.

In this report, a mathematical model of a stream carrying sediment has been described. This model solves the continuity equation for the sediment water mixture and the momentum equation numerically, and corrects the solution at each time step using the continuity equation of the sediment. This model uses an implicit finite difference approximation scheme to discretize the governing equations and a Double Sweep method to solve the system of algebraic equations. The roughness characteristics of the natural streams are predicted using a method proposed recently by two Japanese scientists, Kishi and Kuroki. This method considers the effects of the various bed configurations (sand waves) present in natural streams in an adequate manner and also considers the flow regime and 'skin friction' characteristics. The sediment transport rate required for the model is predicted using the method of Ackers and White, which has been found to be superior to most existing methods. The model thus incorporates the most recent advances in the field of sediment transport and should be capable of yielding reliable predictions of the responses of natural streams to changes in flow and sediment inputs, and to changes in geometry due to river crossings, protection works, realignment, etc. The application of the model is indicated using a hypothetical river reach. The flow charts, the description of the input data, the listing of the computer program and the sample model output are also given. (WATDOC)
W78-07173

2K. Chemical Processes

URANIUM IN RIVER RUNOFF,
Akademiya Nauk SSSR, Moscow. Inst. Okeanologii.
For primary bibliographic entry see Field 5B.
W78-06713

INTRODUCTION TO INSTRUMENTAL ANALYSIS OF WATER POLLUTANTS: TRAINING MANUAL.
Environmental Protection Agency, Cincinnati, OH. Office of Water Program Operations.
For primary bibliographic entry see Field 5A.
W78-06769

DETERMINATION OF AMMONIUM N AND NITRATE N IN ACID PERMANGANATE SOLUTION USED TO ABSORB AMMONIA, NITRIC OXIDE, AND NITROGEN DIOXIDE EVOLVED FROM SOILS,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 5A.
W78-06828

CONTRIBUTION TO THE PROBLEM OF FORECASTING THE MINERAL CONTENT AND CHEMICAL COMPOSITION OF RESERVOIR WATER,
Novocherkassk Inst. of Chemical Hydrology (USSR).
For primary bibliographic entry see Field 2H.
W78-06881

APPARENT ANOMALY IN FREEZING OF ORDINARY WATER,
Cold Regions Research and Engineering Lab., Hanover, NH.
For primary bibliographic entry see Field 1A.
W78-06882

A FILTRATION UNIT FOR USE WITH CONTINUOUS AUTOANALYTICAL SYSTEMS APPLIED TO HIGHLY TURBID WATERS,
Institute for Marine Environmental Research, Plymouth (England).
For primary bibliographic entry see Field 5A.
W78-06894

DEPENDENCE OF THE CHEMICAL COMPOSITION OF GROUND WATERS IN THE NORTHERN CAUCASUS ON THE COMPOSITION OF ENCLOSING ROCKS,
Gidrokhimicheskii Inst., Novocherkassk (USSR).
P. P. Kutseva, and G. S. Konovalov.
Soviet Hydrology, Selected Papers, Vol. 15, No. 2, p 152-159, 1976. 7 fig, 2 tab, 17 ref. Translated from Gidrokhimicheskiye Materialy, Vol. 62, p 83-94, 1975.

Descriptors: *Groundwater, *Water chemistry, *Rocks, *Geochemistry, Chemicals, Chemistry, Chemical analysis, Sampling, Mountains, Geology, *USSR, *Caucasus(USSR).

Groundwaters are in closest and most prolonged contact with rocks, the effect of which is primarily reflected in the composition of these waters. For this reason, it is necessary to study the effect of rocks on the chemistry of groundwaters, which are an important source of supply to surface waters. The dependence of the chemistry of groundwaters on the chemistry of rocks in the high-mountain regions of the Northern Caucasus was investigated. The groundwaters of the zone of intense water exchange of the high mountain regions of the Northern Caucasus, formed in certain rocks or rock complexes, have specific chemical features. The groundwaters of the region can be subdivided into the following groups, depending on the type of enclosing rock and on their chemical composition: waters of extrusive rocks, granites, ultrabasic rocks, phyllite schists, youthful Elbrus lavas, crystalline schists, sulfide rocks, clastic and sandy clay rocks, and metamorphic rocks. The cation composition of the waters is determined by the mineralogical composition of the enclosing rocks. The content of sulfate and chloride ions in the waters depends on the content of these ions in the rocks. The extreme variety of the cation and anion compositions of waters forming in the region of development of Elbrus lavas is produced to a large extent by the composition of the products of volcanic activity contained in the lavas. (Sims-ISWS)
W78-06900

USE OF FERROUS HYDROXIDE FOR DETERMINATION OF NITRATE IN SOIL EXTRACTS,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 5A.
W78-06925

THE KINETICS OF CALCITE DISSOLUTION IN C02-WATER SYSTEMS AT 5 DEG TO 60 DEG C AND 0.0 TO 1.0 ATM C02,
Geological Survey, Reston, VA. Water Resources Div.; and University of East Anglia, Norwich (England).
For primary bibliographic entry see Field 1B.
W78-06936

PROGRAM FOR EVALUATING STREAM QUALITY IN NORTH CAROLINA,
Geological Survey, Raleigh, NC. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-06939

GEOCHEMISTRY,
Geological Survey, Reston, VA. Geologic Div.; and Geological Survey, Reston, VA. Water Resource Div.
R. Brett, and B. B. Hanshaw.
Geotimes, Vol. 28, No. 1, p 27, January 1978.

Descriptors: *Geochemistry, *Reviews, *Projects, *North America, *Chemical reactions, Solvents, Rocks, Solutes, Leaching, Clays, Surface waters, Subsurface waters, Minerology, Physical properties, Water properties, Model studies, Earthquakes, Oceans, Meteoric water, Annual review, Global aspects.

The past year has seen a blossoming of certain fields of geochemical research where previously isolated area were cultivated by a single group. Some of these burgeoning fields owe their existence to techniques developed in response to the lunar-sample program. Examples include: Nd-Sm isotopic studies of meteorites and ancient terrestrial rocks; the use of the consortium approach of assembling a multidisciplined team to tackle a problem; and the handling and analysis of small quantities of material. (Woodard-USGS)
W78-06946

MEASUREMENT OF ABSORPTION COEFFICIENTS OF WATER IN THE VISIBLE SPECTRAL REGION (PHASE I & II),
Missouri Univ., Kansas City.
For primary bibliographic entry see Field 1A.
W78-07052

CHEMICAL COMPOSITION OF RAIN AND BROOK WATER IN BRITTANY (FRANCE), (IN FRENCH),
Rennes Univ. (France). Hydrobiological Lab.
G. Bertru.
Ann Hydrobiol 8(1), p 99-110, 1977.

Descriptors: Seasonal, Water pollution sources, Rain, *Water analysis, Chemicals, Streams, Sodium, Potassium, Calcium, Magnesium, Ions, Leaching, Soils, Chlorides, Sulfates, *Pollutant identification, *France(Brittany).

A study was made of the composition of rain water over a period of 12 mo. and the analyses compared with those of stream water. Analyses were made for Na, K, Ca, Mg, chlorides and sulfates. The composition of stream water may be very dependent of that of the precipitation. The composition of rain water is partly dependent of that of the precipitation. The composition of rain water is partly dependent on geographical location and, perhaps, in part on atmospheric pollution. Examining the ratio to chlorides off all the other ions in the brooks and precipitation, the proportions of chlorides, Na and Mg were fairly close to that of sea water during winter and summer. At Kerloas the proportion of K was higher than in rain water and was from ground sources. Most of the Ca and sulfate in the brooks (Penlan, Kernec, Kerloas, Kerlegan (in France) was from ground sources at all times. The edges decreased the concentration of chlorides when the wind blew from south southeast and south southwest. The dissolved ions in rain water have considerable ecological significance, especially to heavily leached soils with mor humus layers.--Copyright 1978, Biological Abstracts, Inc.
W78-07192

2L. Estuaries

SAFETY OF DIKES AGAINST STORM TIDES AND WAVE RUNUP,
Department of Coastal Protection, Aurich (West Germany).
For primary bibliographic entry see Field 8B.
W78-06714

A LOOK AT COASTAL ENGINEERING STUDY IN JAPAN,
Japan Society of Civil Engineers, Tokyo. Committee on Coastal Engineering.
For primary bibliographic entry see Field 8B.
W78-06716

WAVE RUNUP AROUND LARGE CIRCULAR CYLINDER,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-06718

INFLUENCE OF TIDAL INLETS ON SALINITY IN ESTUARIES,
Indian Inst. of Tech., Madras. Hydraulic Engineering Lab.
For primary bibliographic entry see Field 5B.
W78-06733

ASPECTS OF LAND-TREATED WASTE APPLICATIONS IN LOUISIANA WETLANDS,
Louisiana State Univ., Baton Rouge. Dept. of Marine Sciences.
For primary bibliographic entry see Field 5D.
W78-06744

COMBINED EFFECT OF THERMAL AND ORGANIC POLLUTION ON OXYGEN SAG CURVE - PHASE II,
Worcester Polytechnic Inst., MA.
For primary bibliographic entry see Field 5C.
W78-06751

POLITICS OF SHORE EROSION: WESTHAMPTON BEACH,
State Univ. of New York at Albany. Graduate School of Public Affairs.
For primary bibliographic entry see Field 6E.
W78-06776

METHODOLOGY TO EVALUATE ALTERNATIVE COASTAL ZONE MANAGEMENT POLICIES: APPLICATION IN THE TEXAS COASTAL ZONE, SPECIAL REPORT IV: INSTITUTIONAL IMPACT OF ALTERNATIVE COASTAL ZONE MANAGEMENT SYSTEMS,
Lyndon B. Johnson School of Public Affairs, Austin, TX.
For primary bibliographic entry see Field 6B.
W78-06777

BENCHMARK ESTABLISHMENT AND WATER QUALITY MONITORING IN THE BRIDGEPORT AND BLACK ROCK HARBOR SYSTEMS,
Higher Education Center for Urban Studies, Bridgeport, CT.
For primary bibliographic entry see Field 5A.
W78-06787

BIOAVAILABILITY OF NAPHTHALENES FROM MARINE SEDIMENTS ARTIFICIALLY CONTAMINATED WITH PRUDHOE BAY CRUDE OIL,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Labs.
For primary bibliographic entry see Field 5C.
W78-06834

THE EFFECTS OF THE WATER-SOLUBLE FRACTIONS OF NO. 2 FUEL OIL ON THE EARLY DEVELOPMENT OF THE ESTUARINE FISH, FUNDULUS GRANDIS BAIRD AND GIRARD,
Texas A and M Univ., College Station. Dept. of Biology; and Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Labs.
For primary bibliographic entry see Field 5C.
W78-06841

DISTRIBUTION OF N-PARAFFINS IN SEAGRASSES, BENTHIC ALGAE, OYSTERS AND RECENT SEDIMENTS FROM TERMINOS LAGOON, CAMPECHE, MEXICO,
Universidad Nacional Autonoma de Mexico, Mexico City. Centro de Ciencias del Mar y Limnologia.
For primary bibliographic entry see Field 5B.
W78-06842

NET DRIFT IN AN ATYPICAL ESTUARY, LONG ISLAND SOUND,
Naval Ocean Research and Development Activity, Bay St. Louis, MS.
For primary bibliographic entry see Field 5B.
W78-06843

DISTRIBUTION OF TAR BALLS ON BAHAMIAN BEACHES,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W78-06845

CONTAMINANT INPUTS TO THE NEW YORK BIGHT,
National Oceanic and Atmospheric Administration, Boulder, CO. Marine Ecosystems Analysis Program.
For primary bibliographic entry see Field 5B.
W78-06858

THE METULA OIL SPILL,
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Lab.
For primary bibliographic entry see Field 5B.
W78-06862

COPPER IN THE SEA - A BIBLIOGRAPHY,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Lab.
For primary bibliographic entry see Field 5C.
W78-06865

THE UTILITY OF SKYLAB PHOTO-INTERPRETED EARTH RESOURCES DATA IN STUDIES OF MARINE GEOLOGY AND COASTAL PROCESSES IN PUERTO RICO AND THE VIRGIN ISLANDS,
Geological Survey, San Juan, PR.
For primary bibliographic entry see Field 5B.
W78-06867

A REVIEW OF OIL POLLUTING INCIDENTS IN AND AROUND NEW ENGLAND,
Environmental Research Lab., Narragansett, RI.
For primary bibliographic entry see Field 5B.
W78-06868

A NOTE ON FREE OSCILLATIONS OF CHEDABUCTO BAY,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
F. G. Barber, and J. Taylor.
Manuscript Report Series No. 47, 1977. 43 p, 11 fig, 6 tab, 11 ref, 1 append.

Descriptors: *Tides, *Bays, *Canada, *Model studies, Mathematical models, On-site investigations, On-site data collections, Data processing, Analytical techniques, Water circulation, Tidal waters, Coasts, Estuaries, *Nova Scotia, *Lennox Passage, Causeways, *Chedabucto Bay.

A short series of current observations in Lennox Passage was analyzed using spectrum analysis techniques, and comparisons were made with an analysis of sea level data and with the output of a numerical model. Self-oscillations of Chedabucto Bay were clearly indicated, and possible relationships with other oceanographic parameters were noted. A number of tests of one of the methods of analysis was given. (Sims-ISWS)
W78-06877

THE IDENTIFICATION AND CLASSIFICATION OF TIDAL RECORDS THROUGH PATTERN RECOGNITION,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
G. Godin.
Manuscript Report Series No. 42, 1977. 45 p, 3 fig, 8 tab, 4 ref, 1 append.

Descriptors: *Tides, *Analytical techniques, *Time series analysis, Tidal waters, Water levels, Water level fluctuations, Classification, Data processing, Coasts, Estuaries, Oceans, Oceanography, Tidal records, Pattern recognition.

Tidal records can be characterized by patterns made up of simple statistics carried out on their behavior in time. These patterns may be used to identify and to classify this type of record without the need for a conventional spectral analysis. (Sims-ISWS)
W78-06878

THE USE OF THE ADMITTANCE FUNCTION FOR THE REDUCTION AND INTERPRETATION OF TIDAL RECORDS,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
G. Godin.

Manuscript Report Series No. 41, 1976. 49 p, 15 fig, 8 tab, 14 ref.

Descriptors: *Tides, *Analytical techniques, *Time series analysis, Tidal waters, Water levels, Water level fluctuations, Coasts, Estuaries, Oceans, Oceanography, Tidal records, Admittance function.

The admittance function, already used to calculate the response of water levels to specific physical inputs, was shown to be useful for the reduction of short series of tidal observations, for the construction of cotidal charts, and for the detection of irregularities in the tidal signal or in the recording instrument, provided some care is taken in the choice of the input function. (Sims-ISWS)
W78-06879

MODULATION OF COHERENT MICROWAVE BACKSCATTER BY SHOALING WAVES,
Naval Research Lab., Washington, DC. Ocean Sciences Div.
W. J. Plant, W. C. Keller, and J. W. Wright.
Journal of Geophysical Research, Vol. 83, No. C3, p 1347-1352, March 20, 1978. 7 fig, 1 tab, 14 ref.

Descriptors: *Waves(Water), *North Carolina, *Ocean waves, *Remote sensing, Radar, Instrumentation, Microwaves, Mathematical models, On-site investigations, Coasts, Shores, Oceanography, *Radar backscatter, *Shoaling waves.

The orbital speed of long shoaling waves and the modulation of centimetric wind-generated waves by the shoaling waves were obtained from the frequency and amplitude modulations, respectively, of the backscattered signal of a coherent CW 9.375-GHz radar operated from the end of a pier on the Outer Banks of North Carolina. Modulations anomalously large in comparison with those predicted by the relaxation time model were observed in the range of wind speeds 4.5-6.5 m/s, which was perhaps coincidentally near the shallow water wave speed. Outside this range of wind speeds, the model qualitatively accounted for the magnitude and wind speed dependence of the measured modulations. The phase of the modulation leads to the inference that the maximum amplitude of the short waves occurs near, and generally leeward of, the crests of long waves for wind speeds of up to 8 m/s, the highest wind speed encountered in the experiment. (Sims-ISWS)
W78-06889

AN AVERAGE GEOPOTENTIAL SEA LEVEL SERIES FOR THE UNITED STATES,
National Ocean Survey, Rockville, MD.
S. D. Hicks.
Journal of Geophysical Research, Vol. 83, No. C3, p 1377-1379, March 20, 1978. 1 fig, 1 tab, 11 ref.

Descriptors: *Sea level, *Time series analysis, *United States, Data collections, Data processing, Regression analysis, Tides, Water levels, Oceans, Climatology, Oceanography, Tide stations.

For climate monitoring purposes an average sea level series for the United States, from which a representative curve and a single-value rate were derived, was presented. In addition, the use of dynamic height was introduced in order to take into account the greatly differing latitudes of the tide stations used in the study. The series was obtained by averaging common length uninterrupted sea level elevations reduced from the tide gage measurements of each station. The averaging was by coastal area. The curve, with amplitudes of the averaged meteorological and oceanographic oscillations of periods of less than 5-1/3 yr attenuated more than 90%, showed the relative apparent secular trend and its changes for the United States as a whole. During the 36-yr period 1940-1975, sea level rose along the coast of the United States at the average rate of 1.5 dynamic mm/yr. (Sims-ISWS)
W78-06890

BYPASSING SAND AT COASTAL INLETS.
Civil Engineering-American Society of Civil Engineers, p 57-60, March 1978. 6 fig, 3 ref.

Descriptors: *Inlets, *Inlets(Waterways), *Beach erosion, *Coastal structures, *Bypasses, Littoral drift, Beaches, Breakwaters, Jetties, *Sands, Dredging, Erosion, Channels, Seashores, Coasts, Deposition(Sediments), Coastal engineering, *Sand bypassing.

To reduce dredging requirements and to provide calm navigation channels, the Corps of Engineers often constructs jetties and breakwaters. These structures block sand drifting along the shoreline, so beaches downstream can disappear when eroded sand is not replaced. To remedy this problem, the Corps has used weir jetties and eductor bypass systems. A weir jetty or weir breakwater has a depressed section on it to allow sand to wash over it into an impoundment basin. The basin is then emptied, and the sand is pumped to nourish downstream beaches. One system for excavating sand is the eductor system, which uses water circulating through a submerged nozzle to create a suction; a shore-mounted pump discharges the sand downstream. The Corps is developing design guidelines for weir jetties, has fixed-bed physical models to design them, and has conducted field demonstrtions of weir jetties and the eductor system. (Sims-ISWS)
W78-06891

THE BEHAVIOUR OF DISSOLVED ALUMINUM IN ESTUARINE AND COASTAL WATERS,
University of East Anglia, Norwich (England). School of Environmental Science.
For primary bibliographic entry see Field 5B.
W78-06893

A FILTRATION UNIT FOR USE WITH CONTINUOUS AUTOANALYTICAL SYSTEMS APPLIED TO HIGHLY TURBID WATERS,
Institute for Marine Environmental Research, Plymouth (England).
For primary bibliographic entry see Field 5A.
W78-06894

THE SOURCES OF DISSOLVED MANGANESE TO CALICO CREEK, NORTH CAROLINA,
North Carolina Univ. at Chapel Hill. Curriculum in Marine Sciences.
For primary bibliographic entry see Field 5B.
W78-06895

IDENTIFICATION OF RELEVANT CRITERIA AND SURVEY OF POTENTIAL APPLICATION SITES FOR ARTIFICIAL HABITAT CREATION, VOLUME II, SURVEY OF POTENTIAL APPLICATION SITUATIONS AND SELECTION AND DESCRIPTION OF OPTIMUM PROJECT AREAS.
Coastal Zone Resources Corp., Wilmington, NC.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 526, Price codes: A16 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station Contract Report D-76-2, Volume II, October 1976. 383 p, 93 fig, 94 ref, 1 append. Army DACW39-73-C-0116 (Neg).

Descriptors: *Dredging, *Spoil banks, *Marshes, *Habitats, Wetlands, Shoreline cover, Vegetation, Salt marshes, Coastal marshes, Islands, Sediments, Coasts, Estuaries, *Disposal site selection, Dredged materials, Artificial marsh construction, Artificial habitats.

This report developed a process for the selection of areas appropriate for artificial marsh construction using dredged material. By application of the methodology set forth, Engineer District personnel will be able to identify such areas efficiently. In Volume I of the report, the biophysical and socioeconomic information needed to evaluate potential marsh creation sites was described, and the rationale for the importance of such data was presented. A two-scaled approach to analyzing the information base typically available to the Engineer District was detailed. Specific kinds of problems that might arise and theoretical approaches to their solution also were discussed. The selection rationale was tested in Volume II by the choice and description of 50 prime candidate project areas, 10 within each of 5 major coastal geographical regions. From this compilation, 10 optimum project areas, 2 in each geographical region, were selected and described further using data gathered in the project areas and from relevant Engineer Districts. (Sims-ISWS)
W78-06902

PROCEEDINGS OF THE INTERNATIONAL SYMPOSIUM ON MARINE POLLUTION RESEARCH.
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 5G.
W78-06906

RESEARCH NEEDS CONCERNING POLLUTION OF THE MARINE BENTHOS,
Pacific Northwest Environmental Research Lab., Newport, OR. Marine Science Center.
For primary bibliographic entry see Field 5G.
W78-06914

MICROBIOLOGY AND CHEMISTRY OF ESTUARINE SURFACE MICROLAYERS,
Environmental Research Lab., Gulf Breeze, FL; and Georgia State Univ., Atlanta. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-06917

PETROLEUM HYDROCARBONS IN THE NORTHERN PUGET SOUND AREA--A PILOT DESIGN STUDY,
NOAA National Analytical Facility, Seattle, WA.
For primary bibliographic entry see Field 5C.
W78-06981

HYDROCARBONS IN SEDIMENTS AND BENTHIC ORGANISMS FROM A DREDGE SPOIL DISPOSAL SITE IN RHODE ISLAND SOUND,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5B.
W78-06982

GROWTH, MORTALITY, AND BIOMASS PARTITIONING IN FRESHWATER TIDAL WETLAND POPULATIONS OF WILD RICE (ZIZANIA AQUATICA VAR. AQUATICA),
Rider Coll., NJ. Dept. of Biology.
For primary bibliographic entry see Field 2I.
W78-06986

BEACH PHYTOMASS ALONG THE CALIFORNIA COAST,
California Univ., Davis. Dept. of Botany.
For primary bibliographic entry see Field 2I.
W78-06989

NESTING BEHAVIOR OF HERRING GULLS: INVASION INTO SPARTINA SALT MARSH AREAS OF NEW JERSEY,
Livingston Coll., New Brunswick, NJ. Dept. of Biology.
J. Burger.
Condor, Vol. 79, p 162-169, 1977. 4 fig, 3 tab, 22 ref.

Descriptors: *Nesting, *Coastal marshes, *Gulls, Wetlands, Hatching, New Jersey, Herring gulls, Spartina marsh, Phragmites.

Herring gull nesting behavior and success was examined on types of areas: dry shrub, edge Spartina mat, and wet Spartina areas. Gulls constructed larger and deeper nests in wet, than in dry areas. The behavior of repairing damaged nests was more pronounced in gulls nesting in wet areas. Nests in dry areas had at least one egg hatch in 95-100% of the nests, depending on site. In wet-dry areas hatching success varied from 45 to 88%, and in the wettest areas no eggs hatched. Herring gulls can successfully hatch eggs in Spartina if they select high marsh areas. (Stihler)
W78-06990

A STUDY OF THE COMMON REEDGRASS (PHRAGMITES COMMUNIS TRIN.) IN THE COASTAL ZONE OF DELAWARE,
Delaware Univ., Newark. Coll of Marine Studies.
J. M. Tyrawski.
M.S. Thesis, June 1977, 164 p, 20 fig, 24 tab, 105 ref.

Descriptors: *Wetlands, *Coastal marshes, *Aquatic plants, *Grasses, *Standing crop, *Detritus, *Primary productivity, Biomass, Root development, Rhizomes, Estuarine environment, *Delaware, Coastal plains, Estuaries, Decomposing organic matter, Carbon, Nitrogen, *Reedgrass, Phragmites communis, Biometrical characteristics.

Four colonies of Phragmites communis growing in the coastal zone areas of Delaware were monitored over a period extending from April, 1974, to October, 1975. Investigated were the productive capacities, resource allocation patterns and biometrical characteristics of the colonies and the production and decomposition of the litter. In general, the species was found to be capable of producing large amounts of organic material approaching or exceeding 2000 gm dry weight per square meter and the standing crops of subsurface root and rhizome materials on the order of 4000-6000 gm dry weight per square meter. In areas where a direct link exists between the reed colonies and the other estuarine ecosystem components, a positive contribution can be made to the estuary through the large amount of detritus produced. Significant inter-colony differences were noted to occur in several of the parameters measured including total culm, leaf, and stem weights, leaf weight ratios, culm heights and densities, carbon and nitrogen ratios of the leaf and stem materials. Differences also existed in the leaf area indices, subsurface standing crops, root/shoot ratios, panicle production and reproductive efforts. (Steiner-Mass)
W78-06993

MAN-MADE DEBRIS ON THE BERING SEA FLOOR,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5B.
W78-07033

A MANUAL OF MARSH AND AQUATIC VASCULAR PLANTS OF NORTH CAROLINA WITH HABITAT DATA,
North Carolina Agricultural Experiment Station, Raleigh.
For primary bibliographic entry see Field 2I.
W78-07062

PRODUCTION AND ECOLOGY OF EELGRASS (ZOSTERA MARINA L.) IN GREVELINGEN ESTUARY, THE NETHERLANDS, BEFORE AND AFTER THE CLOSURE,
Delta Inst. for Hydrobiological Research, Yerseke (Netherlands).
For primary bibliographic entry see Field 2I.
W78-07063

HABITAT, MORPHOLOGY AND PHENOLOGY OF SOUTHERN WILD RICE (ZIZANIA AQUATICA L.) FROM THE WADING RIVER IN NEW JERSEY,
Academy of Natural Sciences of Philadelphia, PA. Dept. of Botany.
For primary bibliographic entry see Field 2I.
W78-07064

THE MYXOPHYCEAE OF THE MARSHES OF SOUTHERN DELAWARE,
Delaware Univ., Newark. School of Life and Health Sciences.
For primary bibliographic entry see Field 5C.
W78-07069

SALTWATER POND RESEARCH -- STUDY NO. 2,
Texas Parks and Wildlife Dept., Austin.
R. L. Colura, B. Hysmith, and L. L. Elam.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 230. Price codes: A08 in paper copy, A01 in microfiche. National Oceanic and Atmospheric Administration, Washington, D.C., National Marine Fisheries Service, March, 1976. 156 p.

Descriptors: *Fish farming, *Marine fish, *Shrimp, *Oysters, *Secondary productivity, Fish, Fish management, Fisheries, Marine fisheries, Aquatic animals, Commercial shellfish, Trout, Fungi, Parasitism, Commercial fish, Aquatic productivity, *Saltwater pond research, Fish propagation, Shrimp propagation.

Four saltwater pond research projects, are described. Job 1 is on a study done to determine the feasibility of raising penacid shrimp in a pond culture, to develop and evaluate a water circulation method to aid in the removal of metabolites in a static pond, and to evaluate varying feeding rates and stocking methods for optimum shrimp growth. Job 2 is on research to adapt oysters from several Texas bays exhibiting some resistance to a lethal spawn and rear spotted seatrout, red drum, southern flounder, black drum, and sheepshead in a controlled environment. Job 4 studies the relationship between mortality rate of selected species of fish released after capture with commercial fish gear and the mortality rate of a controlled group of fish. (Steiner-Mass)
W78-07071

TIDAL WETLAND PLANTS OF VIRGINIA,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 2I.
W78-07072

A SURVEY OF GRAMMARID AMPHIPODS OF THE BARATARIA BAY, LOUISIANA REGION,
Louisiana State Univ., Baton Rouge. Dept. of Marine Sciences.
J. D. Thomas.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 796. Price codes: A02 in paper copy, A01 in microfiche. Sea Grant Reprint No. LSU-R-76-016. Reprinted from: Contributions in Marine Science, Vol. 20, p 87-100, Sept., 1976. 1 fig, 31 ref.

Descriptors: *Amphipoda, *Crustaceans, *Louisiana, Aquatic animals, Invertebrates, Marshes, Deltas, Gulf of Mexico, Ecology, Fish, *Grammarid amphipods, *Barataria Bay(Louisiana), Fish stomach contents analysis.

A study was initiated to investigate the species composition, distribution, and ecology of the indigenous amphipod fauna of the Barataria Bay area. Collecting methods included beam trawl, bottom grabs, dipnets, otter trawls, core samples, and examination of marsh grasses and algae by hand. Twenty-one species and one genus appear to be new to science. Largest amphipod populations were found in the Caminada chenier marsh (old beach ridges), as epifaunal components in and among submerged root systems of eroded stands of Distichlis spicata. Analysis of stomach contents of several species of fish in the area revealed Grandidierella bonnieroides Stephenson, Corophium louisianum Shoemaker, and Ampelisca abdita Mills to be the most frequently encountered amphipods. (Stihler-Mass)
W78-07073

SALT MARSH CULICOIDES (DIPTERA: CERATOPOGONIDAE): SPECIES, SEASONAL ABUNDANCE AND COMPARISONS OF TRAPPING METHODS,
North Carolina Agriculture Experiment Stations, Raleigh.
For primary bibliographic entry see Field 2I.
W78-07074

EXISTING LEGAL FRAMEWORK FOR MANAGEMENT OF VIRGINIA'S COASTAL WETLANDS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6E.
W78-07075

PHYSICAL MANAGEMENT OF COASTAL FLOOD PLAINS: GUIDELINES FOR HAZARDS AND ECOSYSTEMS MANAGEMENT.
Conservation Foundation, Washington, DC.
For primary bibliographic entry see Field 6G.
W78-07077

ATMOSPHERIC DISPERSION CHARACTERISTICS IN COASTAL ENVIRONMENTS,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 5A.
W78-07083

ABUNDANCE AND PRODUCTION OF MACROINVERTEBRATES FROM NATURAL AND ARTIFICIALLY ESTABLISHED SALT MARSHES IN NORTH CAROLINA,
North Carolina State Univ. at Raleigh. Dept. of Zoology.
L. M. Cammen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 010. Price codes: A02 in paper copy, A01 in microfiche. Sea Grant Reprint No. 102. Reprinted from: The American Midland Naturalist, Vol. 96, No. 2, p 487-493, October, 1976. 3 tab, 9 ref.

Descriptors: *Salt marshes, *North Carolina, *Dredging, *Invertebrates, Wetlands, Marshes, Aquatic plants, Grasses, Mussels, Aquatic insects, Annelids, Mollusks, *Drum Inlet(NC), *Snow's Cut(NC).

Core samples were taken from dredge soil planted with Spartina alterniflora, soil left bare, and nearby natural marshes at Drum Inlet and Snow's Cut, North Carolina. Insect larvae were dominant in the fauna of both spoil areas in Drum Inlet while polychaetes dominated the natural marsh fauna. At Snow's Cut, polychaetes were dominant in the fauna of the bare spoil, while the planted spoil fauna consisted mainly of amphipods and insect larvae; polychaetes, isopods, and mussels were the most abundant natural marsh fauna. The creek fauna of both areas was dominated by polychaetes. Annual macrofaunal production was estimated for both areas. Production estimates for creek stations generally were higher. There was no consistent relation between the presence of Spartina and the abundance of macrofauna in the spoil plots. (Steiner-Mass)
W78-07084

TIME DEPENDENT MIXING IN A SALT WEDGE ESTUARY,
Washington Univ., Seattle. Dept. of Oceanography.
E. N. Partch, and J. D. Smith.
Estuarine and Coastal Marine Science, Vol. 6, No. 1, p 3-19, January 1978. 8 fig, 3 tab, 15 ref. NSF GA-14178.

Descriptors: *Mixing, *Estuaries, *Salts, *Oregon, Coasts, Tidal waters, Rivers, Sampling, On-site investigations, Profiles, Temperature, Water temperature, *Salinity, Velocity, Water circulation, Turbulence, Internal waves, Tides, Tidal effects, Diffusivity, Froude number, Salt wedges.

Measurements of the profiles of salinity and velocity at a station in the Duwamish River estuary indicated that the turbulent mixing through the density interface is highly time dependent, with the most intense mixing occurring at the maximum current speed during the ebb. Additional measurements of the turbulent kinetic energy and the turbulent flux of salt by the eddy correlation technique verified that interpretation. The vertical turbulent salt flux and the turbulent kinteic energy vary by an order of magnitude over the tidal cycle, and approximately half of the total vertical salt transport takes place during a short time centered about the maximum ebb. Different mechanism of turbulence generation operate at various times during the tidal cycle, and the intense mixing periods were shown to coincide with conditions favorable for the formation of an internal hydraulic jump. (Sims-ISWS)
W78-07094

TIDAL RESUSPENSION IN BUZZARDS BAY, MASSACHUSETTS, I. SEASONAL CHANGES IN THE RESUSPENSION OR ORGANIC CARBON AND CHLOROPHYLL A,
New Hampshire Univ., Durham. Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W78-07095

TIDAL RESUSPENSION IN BUZZARDS BAY, MASSACHUSETTS, II. SEASONAL CHANGES IN THE SIZE DISTRIBUTION OF CHOROPHYLL, PARTICLE CONCENTRATION, CARBON AND NITROGEN IN RESUSPENDED PARTICLE MATTER,
New Hampshire Univ., Durham. Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W78-07096

THE M2 TIDE OF THE IRISH SEA: HOURLY CONFIGURATIONS OF THE SEA SURFACE AND OF THE DEPTH-MEAN CURRENTS,
Alaska Univ., College. Inst. of Marine Science.
J. C. H. Mungall, and J. B. Matthews.
Estuarine and Coastal Marine Science, Vol. 6, No. 1, p 55-74, January 1978. 13 fig, 2 tab, 19 ref. ONR N00014-67-A-0317-0002.

Descriptors: *Tides, *Currents(Water), *Model studies, Mathematical models, Numerical analysis, Water levels, Water circulation, Velocity, Tidal waters, Cycles, Oceanography, *Irish Sea.

The M2 tide of the Irish Sea was described. Following a review of previous work on the area, an overall view of the Irish Sea tides was presented by treating the sea as a one-dimensional channel closed at its northern end. The curves so obtained for the amplitudes and phases of the height and current distributions, along with hourly profiles of the sea surface, served as a convenient graphical summary of the main features of the tide. The time-dependent two-dimensional behavior of the Irish Sea was described with the aid of hourly perspective views of the sea surface and hourly charts of depth-mean current vectors superimposed on lines of equal sea surface heights, a method of display which markedly supplements the conventional co-range and co-tidal charts. The data used for generating the displays were obtained by analyzing the output of a two-dimensional barotropic numerical tidal model. (Sims-ISWS)
W78-07097

AN EVALUATION OF THE USE OF REDOX MEASUREMENTS FOR CHARACTERIZING RECENT SEDIMENTS,
Stockholm Univ. (Sweden). Dept. of Geology.
For primary bibliographic entry see Field 2J.
W78-07098

MEASUREMENT OF 239 · 240 PU IN THE NORTHWESTERN MEDITERRANEAN,
International Lab. of Marine Radioactivity.
C. N. Murray, and R. Fukai.
Estuarine and Coastal Marine Science, Vol. 6, No. 2, p 145-151, February 1978. 1 fig, 3 tab, 16 ref.

Descriptors: *Radioisotopes, *Sea water, *Sediments, *Mussels, Sampling, Data collections, Cores, Oceans, Chemical analysis, Radiochemical analysis, Radioactivity, Oceanography, *Plutonium, *Mediterranean Sea.

Measurements of 239 · 240 Pu were performed on seawater, coastal shore sediments, and mussels collected from the northwestern part of the Mediterranean Sea during 1973-1974. The ranges of 239 · 240 Pu concentrations determined in these samples were respectively 0.5-8.5 fCi/kg for seawater, 0.3-4.2 pCi/kg for dried sediments and 0.42-0.74 pCi/kg wet for total mussel. The relatively higher 239 · 240 Pu concentration found in the deep water may be correlated to the vertical water movement characteristic in the northwestern Mediterranean. (Sims-ISWS)
W78-07099

LATERAL DYNAMIC BALANCE IN THE SANDY HOOK TO ROCKAWAY POINT TRANSECT,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
B. E. Doyle, and R. E. Wilson.
Estuarine and Coastal Marine Science, Vol. 6, No. 2, p 165-174, February 1978. 6 fig, 3 tab, 6 ref.

Descriptors: *Currents(Water), *Estuaries, *Harbors, *Atlantic Ocean, Circulation, Water circulation, Tides, Tidal waters, Coasts, Bays, Flow, Current meters, Measurement, Data processing, *Lateral dynamic balance, *New York Harbor.

Currents associated with the residual nontidal flow through the Sandy Hook to Rockaway Point Transect exhibit considerable vertical and lateral structure, including a two-layer estuarine flow pattern over much of the Transect and inflow to New York harbor at all depths near Rockaway Point. To determine the relative importance of different dynamic processes in maintaining this structure, the nontidal lateral momentum balance in the Transect was examined using current meter and hydrographic data from the 1952 and 1958-1959 Coast and Geodetic Survey field studies in New York Harbor. Results suggested that over the entire Transect the lateral pressure gradient force balances the sum of the centrifugal force associated with the oscillating tidal flow and the Coriolis force due to the non-tidal flow normal to the Transect. This balance is maintain without significant contribution from turbulent shear stresses. Over much of the Transect, the primary balance is between the lateral pressure gradient force and the centrifugal force. (Sims-ISWS)
W78-07100

THE INFLUENCE OF DENSITY VARIATIONS ON ESTUARINE TIDES AND CIRCULATIONS,
Princeton Univ., NJ. Geophysical Fluid Dynamics Lab.
A. F. Blumberg.
Estuarine and Coastal Marine Science, Vol. 6, No. 2, p 209-215, February 1978. 5 fig, 1 tab, 5 ref. NOAA 04-3-022-33.

Descriptors: *Water circulation, *Estuaries, *Model studies, *Chesapeake Bay, Mathematical models, Tidal waters, Rivers, Salinity, Density, Variability, Circulation, Tides, Dynamics, Coasts, Estuarine circulation, Salinity variations, Circulation processes.

Numerical experiments were carried out to investigate the influence of density variations on estuarine tides and circulations. The mathematical model, which was published previously, was outlined. A detailed analysis of the tidal properties and circulations in an estuary was made for two cases. One case involved density variations, while the other assumed a constant density. It was found that the discharge through any section, the tidal range, and the tidal phases were independent of the density structure. However, the actual tidal amplitudes, the mean elevation, and the vertical structure of longitudinal velocity changed considerably in the various experiments. Both cases assumed the same coefficient of bottom friction and bathymetric schematization. (Sims-ISWS)
W78-07101

ON THE CALIFORNIA UNDERCURRENT OVER THE CONTINENTAL SLOPE OFF OREGON,
National Oceanic and Atmospheric Administration, Seattle, Washington. Pacific Marine Environmental Lab.
D. Halpern, R. L. Smith, and R. K. Reed.
Journal of Geophysical Research, Vol. 83, No. C3, p 1366-1372, March 20, 1978. 6 fig, 23 ref. NSF ID071-04211, OCE74-22290.

Descriptors: *Ocean currents, *Continental slope, *Oregon, *Pacific Ocean, On-site data collections, On-site investigations, Currents(Water), Salinity, Temperature, Water temperature, Depth, Current meters, Data processing, Oceans, Oceanography, *California undercurrent.

During July 1975, moored current measurements and a spatially dense approximately isochronal hydrographic survey were made off Oregon. The patterns of geopotential topography, the longshore and onshore-offshore variations in temperature and salinity, and the current measurements indicated a poleward flow of warmer, more saline water at intermediate depths over the continental slope throughout a longshore distance of about 600 km. The agreement between linear approximations of the north-south velocity shears determined from baroclinic geostrophic currents and from 3-day vector-averaged current measurements was within 30%. The current measurements at intermediate depths indicated a wavelike oscillation, lateral meander, or eddy with a time scale of about 7-10 days, and the surface pattern of the geopotential topography (referred to 1000 dbar) contained eddies or a wavelike feature with a wavelength of about 200 km. Comparison of the time variations of currents recorded simultaneously over the slope and shelf indicated that the subsurface poleward flows observed there were connected. (Sims-ISWS)
W78-07107

NORTHEASTWARD DRIFT IN THE NORTHERN MID-ATLANTIC BIGHT DURING LATE SPRING AND SUMMER 1976,
National Ocean Survey, Rockville, MD.
H. R. Frey.
Journal of Geophysical Research, Vol. 83, No. C1, p 503-504, January 20, 1978. 1 fig, 2 ref.

Descriptors: *Ocean circulation, *Ocean currents, *Aquatic drift, *Atlantic Ocean, Drift bottles, Winds, Currents(Water), Water pollution, Pollutants, Oil, Path of pollutants, Oceans, Oceanography, Drifters, Drifter cards.

Air drops of surface drifter cards were made by helicopter south of Long Island approximately monthly from December 1975 to September 1976. Drifters from three successive releases on April 13, May 25, and July 1 were recovered at Cape Cod, Martha's Vineyard, and Nantucket. The northeastward drift is attributed to anomalously persistent southerly winds. (Sims-ISWS)
W78-07108

MATHEMATICAL STUDIES OF TIDAL BEHAVIOUR IN THE BAY OF FUNDY,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
D. A. Greenberg.
Manuscript Report Series No. 46, 1977. 127 p, 45 fig, 11 tab, 27 ref, 1 append.

Descriptors: *Tides, *Bays, *Canada, *Model studies, Mathematical models, Water levels, Water level fluctuations, Barriers, Effects, Tidal waters, Coasts, Estuaries, *Bay of Fundy.

The Bay of Fundy is situated near the border of Canada and the United States. It feeds into the Gulf of Maine which opens out to the north-west Atlantic. The presence of extraordinary high tides in the Bay of Fundy has led to interest in the possibility of establishing tidal power schemes there. A numerical tidal model was set up to test the effects of tidal barrier schemes installed in the upper reaches of the bay. Because it is now thought that such barriers could influence a large area including the Gulf of Maine, it was felt necessary to model this entire area. The model was run for four different barrier schemes with different experiments to simulate permeable and impermeable barries. The permeable barriers were representative of those used in ebb-flow power generation. Significant changes in the M sub 2 tidal regime in the Gulf of Maine were found for some barrier configurations. Perhaps the result which differed most significantly from earlier predictions was a rise rather than a fall in tidal amplitude in front of a barrier placed across from Economy Point to the opposite shore in Minas Basin. (Sims-ISWS)
W78-07116

PLANT SPECIES CHECKLIST FOR THE LAC DES ALLEMANDS SWAMP AREA OF LOUISIANA,
Louisiana State Univ., Baton Rouge. School of Forestry and Wildlife Management.
For primary bibliographic entry see Field 2I.
W78-07144

ESTIMATING THE ECONOMIC VALUE OF NATURAL COASTAL WETLANDS: A CAUTIONARY NOTE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6C.
W78-07146

A TECHNIQUE FOR THE DETERMINATION OF LOUISIANA MARSH SALINITY ZONES FROM VEGETATION MAPPED BY MULTISPECTRAL SCANNER DATA: A COMPARISON OF SATELLITE AND AIRCRAFT DATA,
National Aeronautics and Space Administration, Houston, TX.
For primary bibliographic entry see Field 7B.
W78-07148

DEPOSITIONAL ENVIRONMENTS IN THE COLVILLE RIVER DELTA,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
H. J. Walker.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A034 539, Price codes: A03 in paper copy, A01 in microfiche. Technical Report No. 227, July, 1977. 22 p, 18 fig, 19 ref.

Descriptors: *Alaska, *Sediment discharge, *Geomorphology, *Deltas, Rivers, Estuaries, Ice breakup, Sedimentology, Alluvial channels, Bank erosion, Arctic, Tundra, *Colville River Delta(Alaska).

The Colville River delta is highly varied and complex. The extreme seasonality of processes operating in the Arctic affect river discharge and sedimentation. Most morphologic changes within the delta occur during the short spring and summer especially during the high floods accompanying breakup. Despite the relatively short activity period during the year, morphologic changes may be great. Riverbank erosion is often rapid and the numerous lakes are frequently tapped by meandering distributaries. These tapped lakes, portions of the general tundra surface, and the numerous sand bars and mud flats receive much sediment during flooding. Because river flooding occurs before the breakup of sea ice, floodwater advances over the bootmfast ice prior to draining through the ice to continue seaward as a wedge of fresh but turbid water. The presence of a sea ice cover during the time when most sediment is carried seaward results in the creation of three distinct depositional environments in the subaqueous delta. These are the bottomfast ice zone which receives musch of its sediment secondarily from the sea ice as it melts, sea ice drainage zone which is a narrow band seaward of the bottomfast ice zone, and the freshwater-wedge zone. (Steiner-Mass)
W78-07149

VEGETATION ON ROCKY SHORES AT SOME NORTH IRISH SEA SITES,
Liverpool Univ. (England). Hartley Botanical Labs.
For primary bibliographic entry see Field 5C.
W78-07155

ANAEROBIC MICROBIAL COMMUNITY METABOLISM IN SPARTINA ALTERNIFLORA SOILS,
Georgia Univ., Athens. Dept. of Microbiology.
For primary bibliographic entry see Field 2G.
W78-07156

NITROGEN FIXATION BY ALGAE IN A MASSACHUSETTS SALT MARSH,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
E. J. Carpenter, C. D. Van Raalte, and I. Valiela.
Limnology and Oceanography, Vol. 23, No. 2, p 318-327, 1978. 9 fig, 2 tab, 34 ref.

Descriptors: *Salt marshes, *Cyanophyta, *Nitrogen fixation, *Massachusetts, Wetlands, Marshes, Marsh plants, Aquatic plants, Aquatic algae, Rhizosphere, Great Sippewissett Marsh(Mass).

Over a three-year period, N2 fixation on the surface of a Cape Cod salt marsh was highest in summer, with overall rates of about 10-20 mg N/sq m/day. This average, coupled with N2 fixation in the rhizosphere (ca. 80 mg N/sq m/day), compared favorably with the highest N2 fixation rates measured anywhere. There were significant variations from one marsh habitat to another; the blue-green algae mat had the highest rate of N2 fixation per unit area (100-200 mg N/sq cm/Hour), but due to its large area, the low marsh with short Spartina contributed the greatest amount of fixed N. Nitrogen is fixed on the marsh surface primarily by blue-green algae. (Steiner-Mass)
W78-07157

HABITAT DEVELOPMENT ASPECTS OF THE DREDGED MATERIAL RESEARCH PROGRAM,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 6G.
W78-07158

THE GROWTH OF AQUATIC MACROPHYTES IN THE BAY OF QUINTE PRIOR TO PHOSPHATE REMOVAL BY TERTIARY SEWAGE TREATMENT (1975-1976),
Queen's Univ., Kingston (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-07160

OUR DYNAMIC TIDAL MARSHES: VEGETATION CHANGES AS REVEALED BY PEAT ANALYSIS,
Connecticut Coll., New London.
W. A. Niering, R. W. Warren, and C. G. Weymouth.
Available from Ct Arboretum, Ct Coll., New London, Ct 06320 $.50 + $.30 pstge/copy. The Connecticut Arboretum Bulletin No. 22, January, 1977. 12 p, 6 fig, 14 ref.

Descriptors: *Peat, *Cores, *Sampling, *Tidal marshes, *Connecticut, Coastal marshes, Rhizomes, Wetlands, Storms, Marshes, *Salt marsh dynamics, *Peat analysis, Distichlis sp., Spartina sp., Tidal gates.

Twenty-three one-meter length peat cores were cut from eight different marsh systems representing both shallow and deep marshes along the Connecticut shoreline. Use of the McCaffrey samplet to obtain cores is described in detail. Peat color and texture, type of sediment, and depth of sand layers and shell fragments are noted. The peat is then teased apart and rhizomes present identified. A key to plant remains in salt marsh peat is provided. Cores collected provide evidence of marsh encroachment landward, marsh development seaward, shifts in dominant species over time within a marsh, and the impact of tidal gates. Storms leave evidence of their occurrence in 'sand lines,' some of which are associated with major vegetation changes. (Stihler-Mass)
W78-07163

WATER QUALITY INTERPRETIVE REPORT, PRINCE EDWARD ISLAND, 1961 - 1973,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 5A.
W78-07176

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

ROTATING BIOLOGICAL CONTACTORS TREAT ISLAND'S SALINE SEWAGE,
Rhode Island Univ., Kingston. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5D.
W78-06708

SPIRAL-WOUND POLY(ETHER AMIDE) THIN-FILM COMPOSITE MEMBRANE SYSTEMS,
Universal Oil Products Co., San Diego, CA. Fluid System Div.
R. L. Riley, R. L. Fox, C. R. Lyons, C. E. Milstead, and M. W. Seroy.
Desalination, Vol 19, p 113-126, 1976. 7 fig, 4 tab, 11 ref. OWRT Contract.

Descriptors: *Membranes, *Films, *Polymers, *Reverse osmosis, Saline water, Potable water, Brackish water, Water treatment, *Poly(Ether amide) thin films, Wrightsville Beach(NC), Commercial applications.

Recent advances in the development of poly(ether/amide) thin-film composite membrane systems, formed by in situ interfacial polymerization of the surface of a reinforced-porous supporting membrane, are described. These membrane systems make it possible to produce potable water from seawater by reverse osmosis in a single stage. Stable water fluxes of 0.54 M3/M2-day and sodium chloride rejections of 99% have been attained with 50% water recovery at an applied pressure of 68 atms (1,000 psi) in pilot tests at the Office of Water Research and Technology Seawater test Facility, Wrightsville Beach, North Carolina. For brackish water, higher fluxes and rejections of 98-99% have been attained with 50% water recovery at an applied pressure of 33.3 atms (450 psi). The establishment of large-scale continuous membrane production combined with excellent seawater and brackish water performance of two, four, and six-inch diameter spiral-wound elements demonstrates a significant advance toward the commercial application of thin-film composite membranes. The superior performance, reliability, and apparent durability of the new thin-film composite membranes in comparison with previous cellulose acetate membranes, and the fact that they can be manufactured economically in quantity to rigid specifications indicate that these membranes will soon dominate the field of reverse osmosis for water treatment applications. (Wares - IPA)
W78-06829

GAS SEPARATION MEMBRANES: TECHNOLOGY AND APPLICATIONS,
Universal Oil Products, Inc., San Diego, CA. Basic Development Dept.
L. J. Burnett, and R. L. Riley.
Available from UOP Inc., 4901 Morena Blvd.; Suite 806, San Diego, CA. March 15, 1977. 25 p, 13 fig, 4 tab.

Descriptors: *Separation techniques, *Technology, *Gases, Membranes, Polymers, Films, Conservation, *Commercial applications, Enrichment, Fuel conversion, Poly(Ether amide) thin films.

Gas separation membrane technology and applications are discussed. In the reverse osmosis membrane process, high pressure saline water is placed in contact with a semipermeable membrane (permeable to water but relatively impermeable to salt). The process requires less energy than distillation or freezing processes, since a phase change is not required. A similar process is now being used for separation and enrichment of multi-component gas streams. A discussion of transport phenomenology presents a solution-diffusion model and indicates that the ideal membrane would consist of a thin imperfection-free sheet of a polymer material. Membrane development and requirements are outlined. Advantages and specifications of the spiral-wound element, one of the most unique and useful configurations developed for membrane packaging, are presented. Installation is briefly reviewed. Commercial application in energy conservation practice and in fossil fuel conversion is anticipated. (Wares - IPA)
W78-06830

SCALE-FREE-VAPOR-COMPRESSION EVAPORATION,
Office of Water Research and Technology, Washington, DC.
For primary bibliographic entry see Field 5D.
W78-06994

3B. Water Yield Improvement

CLEARING FOG BY SEEDING WITH CHARGED WATER DROPS: A NUMERICAL STUDY,
Naval Environmental Prediction Research Facility, Monterey, CA.
P. M. Tag.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-027 410. Price codes: A04 in paper copy, A01 in microfiche. NEPRF Technical Paper 6-76, May 1976. 52 p, 17 fig, 1 tab, 28 ref. Prepared for Naval Air Systems Command, Washington, D.C.

Descriptors: *Fog, *Droplets, *Weather modification, *Mathematical models, Model studies, Numerical analysis, Simulation analysis, Mathematical studies, Coalescence, Cloud physics, Meteorology, *Fog dispersal, *Charged drops, Warm fog, Collision efficiencies, Electrical charges, Drop charging, Visibility, Fog seeding, Electrostatic effects.

A numerical study of the use of highly charged water drops to clear warm fog was conducted. The polarization of neutral fog droplets and their capture by the charged drops was the mechanism studied. A multi-leveled microphysical model was used to investigate the degree of visibility improvement resulting from variations in seeding drop size and charge, the type of fog being seeded, and the concentration of seeding material. An evaluation of this technique was made by comparing model results to comparable numerical experiments of hygroscopic seeding, a technique that has been field tested on several occasions. (See also W77-11828) (Sims-ISWS)
W78-06727

AN INTERPRETIVE HISTORY OF THIRTY-YEARS (1945-1975) OF WEATHER MODIFICATION,
Florida State Univ., Tallahassee. Dept. of Statistics.
C. L. Bach.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A039 669. Price codes: A06 in paper copy, A01 in microfiche. ONR Technical Report No. 112, March 1977. 111 p, 14 fig, 3 tab, 269 ref. ONR N00014-76-C-0394.

Descriptors: *Weather modification, *History, *Precipitation(Atmospheric), *Fog, Rainfall, Hail, Storms, Cloud seeding, Silver iodide, Carbon dioxide, Projects, Cloud physics, Meteorology, Weather-modification history.

The development of the physical understanding of weather modification and the evolution of statistical and meteorological design criteria for weather modification experiments for the 30-year period 1945-1975 were investigated. Also, social, economic, and legal problems of weather modification were discussed as they affect the above. Graphs were constructed depicting the chronology of reported articles on storm-system (in this paper 'storm-system' refers to attempts to increase rainfall from extratropical cyclones and organized systems of clouds), cold fog, warm fog, hail, and lightning modification. An attempt was made to explain the changes in the number of experiments reported during the description of the evolution of weather modification. The summary of the 30-year period of weather modification was for three 10-year periods. The first decade was shown to be dominated by scientific innovation and dispute. The second decade featured initiation of efforts by meteorologists and statisticians at ending the controversies of the first 10 years. The third decade was marked by increased exchange of ideas and results of weather modification operations at conferences and symposia and serious investigation into social, economic, and legal ramifications of weather modification. (Sims-ISWS)
W78-06729

REPORT ON THE HAIL SUPPRESSION PROGRAM AT NELSPRUIT, TRANSVAAL, REPUBLIC OF SOUTH AFRICA,
Simpson Weather Associates, Charlottesville, VA.; and Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
J. Simpson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 504. Price codes: A05 in paper copy, A01 in microfiche. NHRE Technical Report NCAR-7100-76/5, June 1976. 91 p, 8 fig, 4 tab, 54 ref.

Descriptors: *Weather modification, *Hail, *Africa, *Tobacco, Damages, Crops, Cloud seeding, Silver iodide, Data processing, Statistics, Model studies, Mathematical models, Radar, Cloud physics, Meteorology, Precipitation(Atmospheric), *Hail suppression, *South Africa.

The Nelspruit (25 deg S latitude, 750 m elevation) hail suppression seeding project completed 4 1/2 years of operation in May 1976. Results of the first 3 1/2 years were reviewed. The 7000 sq km target area (about 1% planted in tobacco) experiences about 50 hail days yearly, produced by warm-based storms mainly of the multicell variety. Unique features of the project include on-top seeding with silver iodide flares dropped from jet aircraft into feeder towers, the joint use of models, and computer and PPI/RHI radar, from which natural hailfall has been associated empirically with the attainment of 8 km by the 45 dbz reflectivity contour. Statistical analyses comprised non-parametric and parametric comparison of two response variables derived from insurance-assessed hail damage to tobacco, comparing the seeded period with historical controls. Decrease of about 40% in damage and 20% in severity for the seeded sample were indicated, which would have been significant at better than 0.05 had the samples been random. Rainfall analyses are in progress; so far an overall decrease associated with the seeding has been shown to be unlikely. (Sims-ISWS)
W78-06875

CHICAGO AREA PROGRAM: A MAJOR NEW ATMOSPHERIC EFFORT,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W78-06885

SEEDABILITY OF WINTER OROGRAPHIC STORMS IN UTAH,
Utah Water Research Lab., Logan.
G. E. Hill.
Prepared for Bureau of Reclamation, Denver, Colo., Div of Atmospheric Water Resources Management. Atmospheric Water Resources Series, Report A2, Dec 1977. 78 p, 57 fig, 13 tab, 18 ref, 2 append. Bur Reclam 14-06-D-7184.

Descriptors: Clouds, *Cloud seeding, *Meteorology, *Orography, *Precipitation(Atmospheric), Silver iodide, Snow, Snowpack, *Weather modification, *Utah, *Winter storms, Wasatch Mountains(Utah).

The primary objective has been to collect and analyze data from (randomized) seeded and unseeded winter storms over the Wasatch Mountains for the purpose of developing and designing cloud seeding technology. Two field programs were conducted sequentially; the first was done by airborne seeding and the second by seeding from mountaintop generators. Analysis of precipitation estimators based upon radar and/or rawinsonde data and target precipitation show that increased precipitation due to seeding may occur under certain meteorological conditions. Favorable conditions were found when the supercooled water concentration as measured by aircraft icing rates was high. Precipitation in these particular seeded storms was several times the amount estimated from relationships derived from meteorological

parameters and unseeded precipitation. Based upon these a posteriori results, it is hypothesized that winter season orograhic precipitation may be increased by about 30 percent by seeding about one-sixth of the storms. Analysis of seeding effects using cloud top temperature on a a priori basis of stratification yielded inconclusive results. Other meteorological aspects related to cloud seeding technology are presented. (Bur Reclam)
W78-06926

COMPUTER MODELING OF CUMULUS CLOUDS DURING PROJECT CLOUD CATCHER,
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
J. H. Hirsch.
Prepared for Bureau of Reclamation, Denver, Colo., Office of Atmospheric Resources Management. Technical Report 71-7, April 1971. 61 p 11 fig, 3 tab, 40 ref, 4 append. Bur Reclam 14-06-D-6796.

Descriptors: *Cumulus clouds, Precipitation(Atmospheric), *Computer models, *Cloud seeding, Cloud physics, *Weather modification, *Great Plains, Model studies, Project Skywater, *Project Cloud Catcher.

A steady-state, one-dimensional model of cumulus convection with parameterized microphysics is applied to cumulus clouds of the Northern Great Plains Region. The numerical model is reviewed and comparisons are made between diagnosed cloud characteristics of the model and observations obtained during an extensive field program in cumulus modification. Correlation coefficients near 0.8 are achieved between model predictions of cloud-top heights and radar reflectivity maxima whereas poorer agreements are reached between incloud characteristics measured by aircraft. The model appears to be a useful objective tool for diagnosis of potential for convective cloud development and the effects of cold cloud seeding. It is an inexpensive, fast, numerical model which may be used operationally in real-time on many rawinsondes. (Bur Reclam)
W78-06927

PROBABLE EFFECT OF SUMMER WEATHER MODIFICATION ON RUNOFF,
Agricultural Research Service, Boise, ID. Northwest Watershed Research Center.
C. L. Hanson, and D. A. Woolhiser.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 104, No. IR1, Proceedings Paper 13608, p 1-11, March 1978. 5 fig, 3 tab, 17 ref, 2 append.

Descriptors: *Weather modification, *South Dakota, *Rainfall-runoff relationships, *Runoff, *Model studies, Rainfall, Precipitation(Atmospheric), Mathematical models, Simulation analysis, Effects, Stochastic processes, Markov processes, Probability, Cloud seeding, Summer, Watersheds(Basins), Hydrology.

A stochastic rainfall-runoff simulation procedure was developed and used to estimate effects of hypothetical increases or decreases in May-September rainfall due to weather modification programs on the runoff regime of western South Dakota rangeland watersheds. The distribution function used to simulate daily precipitation was assumed to be the sum of two exponential distributions. The beta function was used to simulate runoff on days when there was precipitation. The study indicated that, if precipitation increased 1.0 in (25 mm), runoff would be increased 8%-10%, or 0.04 in - 0.14 in (1.0 mm - 3.6 mm), depending on watershed soil characteristics. The study also showed that, if precipitation is decreased 10%, runoff would be decreased about 20% (Sims-ISWS)
W78-07086

3C. Use Of Water Of Impaired Quality

MOVEMENT OF PESTICIDES IN THE SOIL WATER FERTILIZER SYSTEM,
Arkansas Univ., Fayetteville. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-06999

3D. Conservation In Domestic and Municipal Use

HOUSEHOLD WATER CONSERVATION AND WASTEWATER FLOW REDUCTION,
Energy Resources Co., Inc., Cambridge, MA.
M. L. Chan, J. Edwards, M. Roberts, R. Stedinger, and L. Wilson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 578, Price codes: A08 in paper copy, A01 in microfiche. Prepared for Office of Water Planning and Standards, Washington, D.C., July 1976, 143 p, 26 tab, 14 fig, 26 ref, 2 append. 68-02-2964.

Descriptors: *Water conservation, *Legal aspects, *Economics, *Model studies, Building codes, Plumbing, Pricing, *Water-saving devices, Flow reduction, Waste water, Consumer benefits, Producer benefits, Replacement strategies, Water demand functions, Cost functions.

This study investigated the cost-effectiveness of water-saving options which would contribute to the reduction of wastewater flows from households. Water-saving options which were analyzed included household water-conserving devices, metering and pricing schemes, and local ordinances and national policies. After reviewing the literature, the report consideres building and plumbing codes from selected areas to see whether or not they provide constraints on the introduction of water-saving devices and considers state laws to see whether they permit pricing schemes which would allow conservation. A computer model is developed, using water demand functions and cost functions from the literature, to determine the costs and benefits to consumers and producers of various pricing schemes. Through the use of a second computer model, benefits are calculated for various replacement strategies in the adoption of water-saving devices. (Zayac-NC)
W78-06782

SOUTHEASTERN NEW ENGLAND STUDY OF WATER AND RELATED LAND RESOURCES-URBAN WATER AND RELATED LAND RESOURCES-URBAN WATERS SPECIAL STUDY.
Skidmore, Owings and Merrill, Boston, MA.
For primary bibliographic entry see Field 6E.
W78-06792

WASHINGTON, D.C.'S VANISHING SPRINGS AND WATERWAYS,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 4C.
W78-06937

WATER CONSERVATION DEVICES: RESIDENTIAL WATER CONSERVATION.
Office of Water Research and Technology, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 499, Price codes: A02 in paper copy, A01 in microfiche. Also Available from Sup Doc, U S GPO, Washington, DC., 20402. Water Research Capsule Report, 1977, 9 p.

Descriptors: *Water conservation, *Economics, *Technology transfer, Information exchange, *Water conservation devices, *Consumer information.

A consumer-oriented capsule report highlights findings of research projects funded through the Office of Water Research and Technology which treat the significance, economics, and application of water conservation. Water conservation measures and devices, e.g., plastic bottles, toilet inserts, improved ballcocks, dual flush cycle modifictions, water saving toilets, faucet aerators, spray taps, flow control devices, pressure reducing valves, water conserving applications, and landscape irrigation equipment - are briefly described. The economic advantages of water conservation devices are estimated. (Seip-IPA)
W78-06996

3E. Conservation In Industry

FERMENTATION--LESS DEGRADING FOR PROBLEM EFFLUENT TREATMENT,
For primary bibliographic entry see Field 5D.
W78-06705

COAL GASIFICATION AND WATER RESOURCES DEVELOPMENT,
Ohio State Univ., Columbus. Dept. of Civil Engineering.
E. E. Whitlatch, Jr.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. WR2, p 299-314, November 1977. 4 tab, 25 ref. OWRT A-041-OHIO(2).

Descriptors: *Water resources development, *Water consumption(Except consumptive use), *Water resources, *Optimization, *Linear programming, *Economic efficiency, Energy, Environmental engineering, Water requirements, Mathematical models, Equations, Systems analysis, Planning, Natural gas, *Coal gasification, *Economic factors, Cost minimization, Water availability, Industrial plant sites.

A method is developed for determining the location of high and low-Btu coal gasification facilities to minimize the cost of plants, gas transmission, coal supply and transport, solid waste disposal, and water supply. Economic efficiency is achieved in meeting the demand for gas at designated market centers. Linear programming optimization models are developed for this purpose. The method should be useful in planning the joint development of energy and water resources in those regions designated by the Water Resources Council as being constrained by water availability in achieving National energy self-sufficiency. The models can also be used to indicate the tradeoffs between environmental concerns and economic efficiency. It is concluded that the relative availability of water at a potential coal gasification plant site may significantly affect the final price of gas. It is recommended that detailed studies of water use and conservation in both the Lurgi and advanced technology processes be undertaken. (Bell-Cornell)
W78-06740

ECONOMIC IMPACT OF PROPOSED AMENDMENTS TO MERCURY EFFLUENT STANDARDS IN ILLINOIS (R 76-17) (R 76-21),
Southern Illinois Univ. at Carbondale.
For primary bibliographic entry see Field 5G.
W78-06759

A THEORETICAL BASIS FOR EXPLORATION FOR NATIVE COPPER IN NORTHERN WISCONSIN,
Geological Survey, Reston, VA. Geology Div.
For primary bibliographic entry see Field 4B.

W78-06938

PLANNING MODELS WITH ALTERNATIVE COOLING SYSTEMS,
Middle East Technical Univ., Ankara (Turkey). Dept. of Environmental Engineering.
For primary bibliographic entry see Field 6A.
W78-07048

AN INVENTORY OF THE FRUIT AND VEGETABLE PROCESSING INDUSTRY IN CANADA,
Stanley Associates Engineering Ltd., Edmonton (Alberta).
For primary bibliographic entry see Field 5G.
W78-07177

3F. Conservation In Agriculture

THE USE OF LANDSAT DIGITAL DATA AND COMPUTER-IMPLEMENTED TECHNIQUES FOR AN AGRICULTURAL APPLICATION,
National Aeronautics and Space Administration, Houston, TX. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 7B.
W78-06767

ESTIMATING LIVESTOCK WATER USE RATES IN RURAL WATER SYSTEMS,
Burns and McDonnell, Kansas City, MO.
R. S. Schulz, and T. A. Austin.
Iowa State University, Ames. Engineering Research Institute. Preprint ERI-75152, June, 1975. 33 p, 14 fig, 2 tab, 12 ref, append. OWRT A-048-IA (1).

Descriptors: *Stock water, Livestock, *Water consumption, *Iowa, *Regression analysis, Mathematical studies, Computer programs, Analytical techniques, *Water utilization, *Use rates, *Livestock water use, Nomographic analysis.

A series of nomographs describing livestock water use in Iowa's Hospers Rural Water System No. 1 is presented. The objective was to predict livestock water use based on average annual weight and average environmental temperature, and to discuss the pattern of water consumption in a rural water system. Water use rates were recorded continuously during the summer of 1974. A computer program utilizing multiple regression analysis was used to regress water use (the dependent variable) on body weight and ambient temperature (the independent variables) for several livestock types: fattening cattle, feeder cattle, lactating dairy cattle, nonlactating dairy cattle, dairy heifers, swine, and laying and nonlaying chickens; nomographs based on predictor equations were drawn for each type. The nomographs predictions for water use ranged from 8% to 263% of the water metered over a 6-week period with an average of 139%. (Seip-IPA)
W78-06820

SICK WELLS REQUIRE WELL DEVELOPED CURE.
For primary bibliographic entry see Field 5G.
W78-06963

COLORADO PUMP TESTS SHOW HOW TO MAKE BIG DOLLAR SAVINGS.
For primary bibliographic entry see Field 8C.
W78-06964

EFFECT OF DRAIN TUBE OPENINGS ON WATER-TABLE DRAWDOWN.
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W78-07087

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

INFLUENCE OF INFILTRATION ON OVERLAND FLOW,
Missouri Univ., Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-06736

SPECTRAL ANALYSIS OF HYDROMETEOROLOGICAL TIME SERIES,
Central and Southern Florida Flood Control District, West Palm Beach. Resource Planning Dept.
For primary bibliographic entry see Field 2B.
W78-06737

AN ITERATIVE ALGORITHM FOR INTERACTIVE MULTIOBJECTIVE PROGRAMMING,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 6A.
W78-06739

SEASONAL AND STOCHASTIC FACTORS IN WATER PLANNING,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 6A.
W78-06741

INCOMMENSURABLES AND TRADEOFFS IN WATER RESOURCES PLANNING,
Florida Univ., Gainesville. Dept. of Food and Resources Economics.
For primary bibliographic entry see Field 6A.
W78-06746

RED RIVER CHLORIDE REMOTE SENSING STUDY: FINAL REPORT.
Army Engineer District, Tulsa, OK.
For primary bibliographic entry see Field 7B.
W78-06768

DIGITAL COMPUTER PROCESSING OF LANDSAT DATA FOR NORTH ALABAMA,
Computer Sciences Corp., Huntsville, AL.
For primary bibliographic entry see Field 7C.
W78-06770

MISSOURI RIVER BASIN, STATE AND FEDERAL WATER AND RELATED LAND RESOURCE PROGRAMS, FISCAL YEARS 1978-1982.
Missouri River Basin Commission, Omaha, NE.
For primary bibliographic entry see Field 6E.
W78-06771

AN ANALYSIS OF FEDERAL WATER RESOURCE PLANNING AND EVALUATION PROCEDURES.
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 6B.
W78-06772

SHORELINE ECOLOGY OF LAKE POWELL.
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 2H.
W78-06773

ECONOMIC AND TECHNICAL CONSIDERATIONS OF REGIONAL WATER SUPPLY,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 6B.
W78-06784

FLOOD HAZARD IN THE UNITED STATES: A RESEARCH ASSESSMENT,
Colorado Univ., Boulder. Inst. of Behavioral Science.
For primary bibliographic entry see Field 6F.
W78-06786

EVALUATION OF PLANNING FOR FISH AND WILDLIFE: JOHN REDMOND RESERVOIR PROJECT.
Sport Fishing Inst., Washington, DC.
For primary bibliographic entry see Field 6B.
W78-06789

EVALUATION OF PLANNING FOR FISH AND WILDLIFE: LITTLEVILLE RESERVOIR.
Sport Fishing Inst., Washington, DC.
For primary bibliographic entry see Field 6B.
W78-06790

RECREATIONAL ADEQUACY OF BEACH ACTIVITY AND COMPARATIVE REGULATING INFLUENCES,
Rhode Island Univ., Kingston. Sea Grant Program; and Rhode Island Univ., Kingston. Dept. of Sociology.
For primary bibliographic entry see Field 6B.
W78-06791

SOUTHEASTERN NEW ENGLAND STUDY OF WATER AND RELATED LAND RESOURCES-URBAN WATER AND RELATED LAND RESOURCES-URBAN WATERS SPECIAL STUDY.
Skidmore, Owings and Merrill, Boston, MA.
For primary bibliographic entry see Field 6E.
W78-06792

DESIGN AND METHOD OF THE SOCIOLOGICAL RESEARCH IN THE GRAND CANYON RIVER CONTACT STUDY. PART I,
Human Ecology Research Services, Inc., Boulder, CO.
For primary bibliographic entry see Field 6B.
W78-06793

USE LEVELS AND CROWDING IN THE GRAND CANYON. RIVER CONTACT STUDY. PART III,
Human Ecology Research Services, Inc., Boulder, CO.
For primary bibliographic entry see Field 6B.
W78-06794

FLOOD PLAIN INFORMATION: OHIO RIVER, CABEL COUNTY/WAYNE COUNTY, WEST VIRGINIA.
Army Engineer District, Huntington, WV.
Prepared for West Virginia Department of Natural Resources, Division of Water Resources, May 1973. 38 p, 12 plates, 2 tab.

Descriptors: *West Virginia, *Floodwater, *Flood flow, *Streamflow forecasting, *Flood profiles, *Flood data, Floods, Historic floods, Peak discharge, Flow characteristics, Stage-discharge relations, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Warning systems, Control structures, Levee, Floodwalls, Reservoirs, Wayne County(WV), Cabel County(WV), *Ohio River(WV), Intermediate Regional Flood.

The study area includes the portions of the Ohio River and its flood plain in Cabel and Wayne Counties, West Virginia. Developments in the flood plain are largely protected by flood walls, earthen levees, and upstream dams. The unprotected portions of the flood plain contain urban, industrial, commercial, and agricultural land uses. Flood data were obtained from topographic maps, historical sources, field studies, and stream gage records. The main flood season occurs in the winter and spring months, and results from heavy general rainfall combined with snowmelt. The worst flood recorded at Old Lock and Dam 28 at Huntington, West Virginia, occurred on January 27, 1937. The flood discharged 654,000 cubic feet per second (cfs) and crested at 559.2 feet mean sea level (msl). At the same location, the Intermediate Regional Flood would crest at 552 feet msl, while the Standard Project Flood would be equivalent in intensity to the 1937 flood. There are no significant obstructions to flood flows in the study area. The levees, floodwalls and pumping station built after the 1937 flood to protect the heavily developed areas, and 37 existing reservoirs plus eight additional reservoirs under construction would in combination, reduce flood heights considerably along the study area. The information in this report in intended for use in land use planning and management in the unprotected portions of the flood plains. (Nessa-NC)
W78-06795

FLOOD PLAIN INFORMATION: LITTLE PAPILLION CREEK AND SOUTH BRANCH, VOLUME II, OMAHA METROPOLITAN REGION, NEBRASKA.
Army Engineer District, Omaha, NE.
Prepared for Papio Watershed Board, NB, April 1968, 45 p, 2 fig, 11 plates, 6 tab.

Descriptors: *Nebraska, *Floods, *Flood forecasting, *Flood profiles, *Flood data, *Flood stages, Flood flow, Indirect flood measurement, Storms, Historic floods, Peak discharge, Stage-discharge relations, Flood damage, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Land use, Planning, Control structures, *Little Papillion Creek(NB), Omah(NB), *South Branch Papillion Creek(NB), Douglas County(NB), Sarpy County(NB), Intermediate Regional Flood.

The study area includes Little Papillion and South Branch Papillion Creeks and their flood plains in Douglas and Sarpy Counties, in the Omaha, Nebraska Metropolitan Region. Volume I in this series presented information on Big Papillion Creek and West Branch. The Papillion Creek system includes over one-half of the city's land area and nearly all the land available for future expansion. The Little Papllion Creek flood plain is extensively developed with residential and commercial land uses, while the South Branch flood plain is used almost entirely for agricultural purposes. Flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. The main flood season occurs during the summer months and results from intense thunderstorms. Rapid springtime snowmelt combined with heavy rainfall may also cause flooding. General characteristics of the basin are presented, as well as detailed descriptions of the study reaches on individual streams, and historic and future flood profiles for the entire study area. The worst flood recorded on Little Papillion Creek occurred on June 3, 1943, discharging 12,500 cubic feet per second (cfs). Higher discharges have been recorded at this location, but damage has been less severe. At the same location, the Intermediate Regional Flood would discharge 17,800 cfs while the Standard Project Flood would discharge 39,000 cfs. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-06796

FLOOD PLAIN INFORMATION: PAPILLION, BIG PAPILLION AND WEST PAPILLION CREEKS, VOLUME I, OMAHA METROPOLITAN REGION, NEBRASKA.
Army Engineer District, Omaha, NE.
Prepared for Papio Watershed Board, NB, November 1967, 48 p, 3 fig, 20 plates, 9 tab.

Descriptors: *Nebraska, *Floods, *Flood forecasting, *Flood profiles, *Flood data, *Flood stages, Flood flow, Indirect flood measurement, Storms, Historic floods, Peak discharge, Stage-discharge relations, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Land use, Planning, Control structures, Omaha(NB), *Papillion Creek(NB), *Big Papillion Creek(NB), *West Branch Papillion Creek(NB), Intermediate Regional Flood.

This report is the first in a series of volumes presenting flood plain information for the Papillion Creek basin streams. The study area covers about 8 stream miles and includes Papillion, Big Papillion, and West Branch Papillion Creeks and their flood plains in the Omaha, Nebraska Metropolitan Area. The developments on the flood plains are similar in extent and composition, consisting of some residential and commercial land uses, and some open space and agricultural land uses. Flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. The main flood season occurs during summer months, resulting from intense thunderstorms. Rapid spring snowmelt combined with heavy rainfall may also cause flooding. Some channel straightening and levee work has been undertaken in the study area to reduce the severity of flooding. General characteristics of the basin and detailed descriptions of study reaches on the individual creeks are presented; historic and future flood profiles are provided for the entire study area. The worst flood recorded on al three streams occurred on June 16-17, 1964; on Papillion Creek, this flood discharged 32,300 cubic feet per second (cfs), cresting 17 feet above flood stae at the Fort Crook gage. At the same location, the Intermediate Regional Flood would discharge 44,900 cfs and would crest 20 feet above flood stage, while the Standard Project Flood would discharge 94,000 cfs and would crest 27 feet above flood stage. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-06797

FLOOD PLAIN INFORMATION: THOMAS CREEK, COLE CREEK, HELL CREEK, WEST BRANCH PAPILLION CREEK EXTENSION, BIG PAPILLION CREEK EXTENSION, VOL. III, OMAHA METROPOLITAN REGION, NEBRASKA.
Army Engineer District, Omaha, NE.
Prepared for Papio Watershed Board, NB, May 1969, 47 p, 19 plates, 9 tab.

Descriptors: *Nebraska, *Floods, *Flood forecasting, *Flood profiles, *Flood data, *Flood stages, Flood flow, Indirect flood measurement, Storms, Historic floods, Peak discharge, Stage-discharge relations, Flood damage, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Land use, Planning, Control structures, Channel improvement, *Thomas Creek(NB), *Cole Creek(NB), *Hell Creek(NB), *West Branch Papillion Creek(NB), *Big Papillion Creek(NB), Omaha(NB), Intermediate Regional Flood.

This report extends the flood plain information on Big Papillion Creek and West Branch covered in Vol. I-Flood Plain Information, Omaha Metropolitan Region. The Papillion Creek system, draining western Omaha, includes over one-half of the city's land area and nearly all the land available for future expansion. The study area covered in this report includes Hell, Cole, and Thomas Creeks, portions of West Branch Papillion and Big Papillion Creeks, and their flood plains in the vicinity of Omaha, Nebraska. Flood plain developments vary from sparse to intensive, and consist of residential, commercial, agricultural and open space land uses. The main flood season occurs during the summer months and results from intense thunderstorms. Rapid springtime snowmelt combined with heavy rainfall may also cause flooding. Channel improvements on most of the basin streams help to reduce flooding; however, serious flooding still occurs. General conditions for each of the streams are described. Flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. Historic and future flood profiles are provided for each of the streams in the study area. The worst flood recorded on West Branch Papillion Creek near Papillion occurred on June 16-17, 1964, and discharged 40,800 cubic feet per second (cfs). At approximately the same location, the Intermediate Regional Flood will discharge 22,450 cfs while the Standard Project Flood will discharge 37,200 cfs. This study is intended for use in making land use planning and management descisions concerning flood plain utilization. (Nessa-NC)
W78-06798

FLOOD PLAIN INFORMATION: ASHLAND, NEBRASKA, SALT CREEK, WAHOO CREEK.
Army Engineer District, Omaha, NE.
Prepared for City of Ashland and State of Nebraska, July 1976, 44 p, 18 fig, 10 plates, 8 tab.

Descriptors: *Nebraska, *Flood flow, *Streamflow forecasting, *Flood data, Floods, Indirect flood measurement, Flood profiles, Historic floods, Flood frequency, Flood stages, Peak discharge, Stage-discharge relations, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Warning systems, Land use, Planning, Control structure, Levee, Reservoirs, Ashland(NB), *Wahoo Creek(NB), *Salt Creek(NB), Intermediate Regional Flood.

The study area includes Salt Creek, Wahoo Creek, and their flood plains in the vicinity of Ashland, Nebraska. Residential and commercial land uses on the flood plain would be damaged by serious flooding. A number of flood control structures have been constructed on Salt Creek and tributaries, including levees along Salt Creek and several reservoirs. Flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. The main flood season occurs from March through October, and results from heavy general rainfall with or without snowmelt. The worst flood recorded on Salt Creek below its confluence with Wahoo Creek at the downstream study limit occurred on June 25, 1963. It discharged 87,000 cubic feet per second (cfs) and crested at 1061.68 feet mean sea level (msl). At approximately the same location, the Intermediate Regional Flood would discharge 98,000 cfs and would crest at 1067.4 feet msl, while the Standard Project Flood would discharge 180,000 cfs and would crest at 1070.0 feet msl. Several bridges in the study area would interfere with these flood flows, and several highways would be inundated by them. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-06799

FLOOD PLAIN INFORMATION: PLATTE RIVER, WARM SLOUGH, TROUBLE CREEK, CENTRAL CITY, NEBRASKA.
Army Engineer District, Omaha, NE.
Prepared for Central City and Nebraska Natural Resources Commission, September 1975, 55 p, 15 fig, 12 plates, 10 tab.

Descriptors: *Nebraska, *Flood flow, *Streamflow forecasting, *Flood data, Floods, Indirect flood measurement, Flood profiles, Historic floods, Flood frequency, Peak discharge, Stage-discharge relations, Flood plains, Ice jams, Flood

protection, Standard Project Flood, Non-structural alternatives, Flood plain zoning, Flood plain insurance, Warning systems, Land use, Planning, Control structures, Dams, *Platte River(NB), *Warm Slough(NB), *Trouble Creek(NB), Central City(NB), Intermediate Regional Flood.

The study area includes the Platte River, Trouble Creek, Warm Slough, and their flood plains in the vicinity of Central City, Nebraska. The flood plain is mostly agricultural or undeveloped in the rural area. The urban flood plain contains residential, commercial and industrial land uses. Flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. The main flood season occurs from February through June and results from heavy general rainfall combined with snowmelt. Ice jams may also cause serious flooding. A number of dams in the upper portion of the basin serve to reduce flood damages in the study area; additional flood discharge reduction is achieved by irrigation diversion structures and some channel cleanout and modification within the study reach. The worst flood recorded on the Platte River near the study area occurred on June 24, 1905. It discharged 44,100 cubic feet per second (cfs). At Central City, the Intermediate Regional Flood would discharge 34,000 cfs while the Standard Project flood would discharge 58,000 cfs; at the downstream study limits the IRF would crest at 1684.7 feet mean sea level (msl) and the SPF would crest at 1686.0 feet msl. Flooding on Trouble Creek and Warm Slough would be most damaging, with flood depths rising as high as five feet. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-06800

FLOOD PLAIN INFORMATION: GREAT FALLS, MONTANA, VOLUME I - SUN RIVER.
Army Engineer District, Omaha, NE.
Prepared for City of Great Falls, Montana, February 1973, 28 p, 17 fig, 6 plates, 3 tab.

Descriptors: *Montana, *Flood flow, *Flood forecasting, *Flood data, Floods, Indirect flood measurement, Streamflow forecasting, Flood profiles, Flood stages, Peak discharge, Stage-discharge relations, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Warning systems, Land use, Planning, Control structures, Great Falls(MT), *Sun River(MT), Intermediate Regional Flood.

The study area includes the Sun River and its flood plain in the vicinity of Great Falls, Montana. The flood plain consists primarily of residential land uses, and to a lesser extent, commercial and industrial developments. Flood data were obtained from topographic maps, historical sources, and field studies. Stream gage records for the study area are not available, although gage records kept 13 miles upstream at Vaughn are indicative of the flood situation. The main flood season occurs in May and June and results from rainfall combined with heavy snowmelt. The worst flood recorded at Vaughn occurred on June 9, 1964, discharging 53,500 cubic feet per second (cfs). At the mouth of the Sun River, the Intermediate Regional Flood would discharge 39,000 cfs and would crest at 3317.2 feet mean sea level (msl), while the Standard Project Flood would discharge 65,000 cfs and would crest at 3320.0 feet msl. One bridge in the study area would obstruct these flood flows. Structural flood control measures have been designed but not implemented. Non-structural measures have not been devised. This study is designed for use in making land use planning and management decisions regarding flood plain utilization. Volume II, a similar report, is planned at a later date for the Missouri River flood plain at Great Falls. (Nessa-NC)
W78-06801

SPECIAL FLOOD HAZARD INFORMATION REPORT: GALLATIN RIVER, GALLATIN COUNTY, MONTANA.
Army Engineer District, Omaha, NE.
Prepared for City of Bozeman, County of Gallatin, MT, May 1973, 23 p, 4 fig, 21 plates, 5 tab.

Descriptors: *Montana, *Streamflow forecasting, *Flood profiles, *Flood data, Floods, Historic floods, Peak discharge, Stage-discharge relations, Flood plains, Flood protection, Non-structural alternatives, Land use, Planning, Gallatin County(MT), *Gallatin River(MT), 50-year flood, 100-year flood.

The study area includes the portions of Gallatin County, Montana, that are subject to flooding from the Gallatin River. There are no urban areas in the study reach. Flood plain developments are almost exclusively agricultural although scattered residential land uses exist. The Gallatin River area is close to Yellowstone National Park historical and scenic attractions and many opportunities for fishing and big game hunting; many tourists and sportsmen are attracted to the area. There is an abundance of land for development outside of the flood plain, creating an ideal situation for flood plain zoning. Flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. Flooding may occur at any time and results from heavy general rainfall, rapid snowmelt, or both. The worst recent flood recorded at the Logan gage occurred on June 10, 1970. The flood discharged 9,390 cubic feet per second (cfs). At the same location, the 50-year flood would discharge 9,470 cfs and would crest at 4095.8 feet mean sea level (msl), while the Standard Project Flood would discharge 10,300 cfs and would crest at 4096.3 feet msl. Relatively small volumes of water have produced some of the Gallatin's highest crests due to ice jams at bridges. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-06802

FLOOD PLAIN INFORMATION: BIG THOMPSON RIVER, LOVELAND TO THE LARIMER-WELD COUNTY LINE, COLORADO, LITTLE THOMPSON RIVER, BOULDER AND LARIMER COUNTIES NEAR BERTHOUD, COLORADO.
Army Engineer District, Omaha, NE.
Prepared for Larimer County, Boulder County, Colorado, and Colorado Water Conservation Board, June 1977, 31 p, 11 fig, 28 plates, 8 tab.

Descriptors: *Colorado, *Streamflow forecasting, *Flood forecasting, *Flood data, Floods, Flood flow, Historic floods, Peak discharge, Flow characteristics, Non-structural alternatives, Flood plain zoning, Warning systems, Control structures, Levee, Larimer County(CO), Boulder County(CO), *Big Thompson River(CO), *Little Thompson River(CO), Loveland(CO), 100-year flood, 500-year flood.

The study area involves the portions of Larimer and Boulder Counties, Colorado that are subject to flooding from Big Thompson and Little Thompson Rivers. The flood plain consists primarily of agricultural land that is experiencing development pressure from Denver. Flood data were obtained from topographic maps, historical sources, field studies, and stream gage records. The main flood season occurs from May through July, although annual peak discharges have occurred from March through September. Flooding results from intense local thunderstorms or heavy general rainfall. The worst flood recorded on the Big Thompson River at the U.S. Geological Survey gage near Drake occurred on July 31, 1976. The flood discharged an estimated 31,200 cubic feet per second (cfs). On the Little Thompson River the worst flood was recorded in May 1957, discharging 4,000 cfs. At the upstream study limit of Big Thompson River, the 100-year flood would discharge 19,000 cfs while the 500-year flood would discharge 40,000 cfs. On the Little Thompson River, the figures at the upstream study limit are 8,800 cfs and 17,000 cfs, respectively, for the 100- and 500-year floods. Historic and projected flood data are presented for the entire study area for 10-, 50-, 100- and 500-year floods. This study is intended for use in making land use planning and management decisions regarding utilization of the flood plain. (Nessa-NC)
W78-06803

PUBLIC PARTICIPATION IN WATER RESOURCES PLANNING: A CASE STUDY AND LITERATURE REVIEW,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W78-06809

STUDIES OF PUBLIC PREFERENCES AND GROUP INTERACTIONS TO GUIDE LAND-USE PLANNING AND CONTROL,
Iowa State Univ., Ames. Dept. of Sociology.
For primary bibliographic entry see Field 6B.
W78-06812

CONSIDERATIONS IN DETERMINING THE PUBLIC INTEREST,
Iowa State Univ., Ames. Dept. of Sociology and Anthropology.
For primary bibliographic entry see Field 6B.
W78-06817

GUIDELINES FOR DEVELOPING STATE AND NATIONAL PUBLIC LAND USE POLICIES,
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W78-06825

ENVIRONMENTAL IMPACT AND RESOURCE MANAGEMENT PROBLEMS CAUSED BY RESERVOIR PROJECTS,
Iowa State Univ., Ames. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 6G.
W78-06826

COMPARISON OF ANNUAL STREAMFLOW MODELS,
Washington Univ., Seattle. Department of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-06851

U. S. PROGRAMS IN RESEARCH DRAINAGE BASINS--AN INTERIM ASSESSMENT.
National Research Council, Washington, DC.
For primary bibliographic entry see Field 2A.
W78-06873

MEAN ANNUAL RUNOFF IN THE UPPER OHIO RIVER BASIN, 1941-70, AND ITS HISTORICAL VARIATION,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-06932

CONTRIBUTION OF REMOTE SENSING TO HABITAT EVALUATION AND MANAGEMENT IN A HIGHLY ALTERED ECOSYSTEM,
Great Dismal Swamp National Wildlife Refuge, Suffolk, VA.; and Geological Survey, Reston, VA. Water Resources Div.
M. K. Garrett, and V. Carter.
In: Transactions of the 42nd North American Wildlife and Natural Resources Conference, 1977. Published by the Wildlife Management Institute, p 56-65, Washington, D.C., 1977. 2 fig, 13 ref.

Descriptors: *Ecosystems, *Remote sensing, *Swamps, *Virginia, *North Carolina, Succession, Environmental effects, Wetlands, Management, Aerial photography, Satellites(Artificial), Hydrology, Vegetation, Wildlife management, National wildlife refuges, *Great Dismal Swamp(Va-NC).

The Great Dismal Swamp National Wildlife Refuge, established in 1973, presently encompasses 53,000 acres of forested wetland within the Great Dismal Swamp of southeastern Virginia and northeastern North Carolina. Approximately 123,000 acres of the total 210,000 acres of swamp have been recommended for public ownership; the remaining acreage has been separated from the main body of the swamp and has been extensively ditched in preparation for agriculture. The U.S. Fish and Wildlife Service has the responsibility for evaluating and developing management priorities for the primary 123,000 acre unit. The refuge cooperates with other Federal, State and city agencies and provides educational opportunities for the general public. The purpose of this paper is (1) to explain why the Great Dismal Swamp is considered a highly altered ecosystem; (2) to illustrate how the formulation of management policy is complicated by the habitat diversity resulting from physical alterations; and (3) to demonstrate how remote sensing has aided in both habitat evaluation and management of the swamp ecosystem. (Woodard-USGS)
W78-06935

APPLICATION OF A MATHEMATICAL MODEL TO ESTIMATE WATER LEVELS,
Geological Survey, Reston, VA. Water Resources Div.; and Geological Survey, Boston, MA. Water Resources Div.
G. D. Tasker, and J. H. Guswa.
Ground Water, Vol 16, No 1, p 18-21, January-February 1978. 4 fig, 1 tab.

Descriptors: *Water levels, *Estimating, *Mathematical models, *Observation wells, *Massachusetts, Analytical techniques, Regression analysis, Water table, *Cape Cod(Mass), Bimonthly measurements.

A mathematical model for estimating daily water levels from less than daily observations as used to analyze an existing water-level observation network on Cape Cod, Massachusetts. The analysis indicated that for those sites which are not affected by tidal fluctuations or man-made influences (such as pumping), six water-level measurements per year would allow daily water levels to be interpolated with a standard error of estimate of about 0.06 meters. (Woodard-USGS)
W78-06944

REVIEW OF AUSTRALIA'S WATER RESOURCES 1975,
Geological Survey, Reston, VA. Water Resources Div.
L. A. Heindl.
EOS, Vol 59, No 1, January 1978. American Geophysical Union, p 18 and 21, 1978.

Descriptors: *Water resources, *Australia, Publications, *Reviews, *Available water, Surface waters, Groundwater, Hydrology, Streamflow, Runoff, Water management(Applied), Watersheds(Basins), Evaluation.

A condensed assessment is presented of the publication 'Review of Australia's Water Resources 1975,' its first since the initial assessment attempt in 1963. In the intervening years the Australian and State governments expanded their programs of water data collection, field investigation, and hydrological research and broadened their approach to water management to include consideration of socioeconomic and environmental factors. Under these circumstances it was logical to expect a 1975 review of Australia's water resources to include evaluations of the immeasurable factors and an assessment that would attempt to balance the immeasurable and the measurable. In spite of some excellent pictures and descriptions, the volume is predominantly a straightforward summary of discharges per time per unit area. (Woodard-USGS)
W78-06947

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1976--VOLUME 1. NORTHEAST FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06952

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1976--VOLUME 2. SOUTH FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06953

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1976--VOLUME 4. NORTHWEST FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06954

INVENTORY OF RIPARIAN HABITATS,
Arizona Game and Fish Dept., Phoenix; and Geological Survey, Tucson, AR. Water Resources Div.
D. E. Brown, N. B. Carmony, and R. M. Turner.
In: 'Importance, Preservation and Management of Riparian Habitat: A Symposium'; Tucson, Arizona, July 9, 1977: USDA Forest Service, General Technical Report RM-43, p 10-13, 1977. 8 ref.

Descriptors: *Reviews, *Maps, *Perennial streams, *Wetlands, *Arizona, Riparian plants, Analytical techniques, Evaluation, Riparian waters, Management, Soil-water-plant relationships, Ecosystems, *Riparian habitat inventory.

This paper discusses a recently published map of Arizona's perennial streams and important wetlands. Perennial streams were illustrated rather than riparian vegetation because the steams are of more direct biotic significance and are more readily identifiable. Inventory procedures used in preparing the map were outlined and the categories of streams and wetlands described. The authors of this paper, who also prepared the map 'Drainage Map of Arizona Showing Perennial Streams and Some Important Wetlands, 1977,' believe that their inventory procedures are applicable to other Southwestern States and will prove useful in the delineation of their aquatic, riparian, and wetland biotic resources. (See also W78-03661) (Woodard-USGS)
W78-06955

EFFECTS OF FUNGI AND BACTERIA ON THE DECLINE OF ARTHROPOD-DAMAGED WATERHYACINTH,
Florida Univ., Gainesville. Dept. of Plant Pathology.
R. Charudattan, B. D. Perkins, and R. C. Littell.
Weed Science, Vol. 26, p 101-107, March, 1978. 6 tab, 12 ref. OWRT A-033-FLA(4), 14-34-0001-8010.

Descriptors: *Biocontrol, Plant pathogens, *Aquatic fungi, *Bacteria, *Water hyacinth, *Plant pathology, *Aquatic weed control, Florida, Microorganisms, Arthopods, Weevils, Mites.

A survey of the fungal and bacterial flora of waterhyacinth, infested with Neochetina eichhorniae (weevil) and Orthogalumna terebrantis (mite) was undertaken to determine the role of microorganisms in the decline of this host in Florida. Generally arthropod-infested plants were more diseased, had smaller laminae, lower numbers of live petioles and higher numbers of dead petioles per plant than noninfested plants. Several parasitic fungi, and soft-rot bacteria occurred randomly on arthropod-infested and noninfested plants; in higher numbers on arthropod-infested, than on noninfested plants. Acremonium zonatum a virulent pathogen of waterhyacinth, and other necrotic leaf-spot diseases ('disease B') were predominant on arthropod-damaged plants. Disease B was independent on the arthropods, while A. zonatum incidence on waterhyacinth was related especially to damage by adult mites. The weevil also aided Z. zonatum infections by creating ports for its entry into the host. In laboratory, waterhyacinths could be killed by the combined effects of the weevil and A. zonatum. In fields, the combined effects of arthropods and diseases led to reduction in the photosynthetic area of waterhyacinth and to root- and crown-rots. It is recommended that biological control of waterhyacinth in Florida should include pathogens and insects. (Morgan-Florida)
W78-07002

THE ANALYSIS OF MULTIVARIATE TIME SERIES WITH A VIEW TO APPLICATIONS IN HYDROLOGY,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 2A.
W78-07016

OPTIMAL FLOOD LEVEE DESIGNS BY DYNAMIC PROGRAMMING,
Water Resources Center, Budapest (Hungary).
For primary bibliographic entry see Field 8B.
W78-07017

MISSOURI RIVER DEVELOPMENT POLICY AND RURAL COMMUNITY DEVELOPMENT,
Nevada Univ., Reno. Renewable Natural Resources Div.
For primary bibliographic entry see Field 6B.
W78-07041

WATER RESOURCES MODELING AND OPTIMIZATION BASED ON CONSERVATION AND FLOODING POOLS,
Kansas State Univ., Manhattan. Dept. of Industrial Engineering.
For primary bibliographic entry see Field 6A.
W78-07046

MAN-MADE LAKES: ATTITUDE SURVEYS OF THEIR VALUE IN RESIDENTIAL AREAS,
Hydrocomp, Inc., Atlanta, GA.
For primary bibliographic entry see Field 6B.
W78-07050

A SIMPLIFIED HYDROMETEOROLOGIC MODEL AND SOME REGIONAL APPLICATIONS,
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France).
For primary bibliographic entry see Field 2A.
W78-07056

BASIN-WIDE PLANNING FOR URBAN STORMWATER MANAGEMENT,
Jorden (W. L.) and Co., Inc., Decatur, GA.
For primary bibliographic entry see Field 5G.
W78-07058

EXISTING LEGAL FRAMEWORK FOR MANAGEMENT OF VIRGINIA'S COASTAL WETLANDS,
Virginia Polytechnic Inst. and State Univ. Blacksburg. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6E.
W78-07075

EFFECT OF DRAIN TUBE OPENINGS ON WATER-TABLE DRAWDOWN,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
R. W. Skaggs.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 104, No. IR1, Proceedings Paper 13606, p 13-21, March 1978. 5 fig, 2 tab, 13 ref, 1 append.

Descriptors: *Tile drainage, *Drawdown, *Model studies, Mathematical models, Drains, Tile drains, Groundwater, Soil water, Soil water movement, Filters, Tiles, Water table, Agriculture, Tile envelopes.

Conventional methods assume that the drain tube is completely open and offers no resistance to the entry of water. An approximate method of determining the effect of drain tube openings on water table drawdown was presented, based on the use of Hooghoudt's equivalent depth to account for convergence near the drain during water table drawdown. Data from the literature were used to define an effective drain tube radius, r sub e, for drains with a finite number of openings. The r sub e value was used then to define the Hooghoudt equivalent depth which was, in turn, used in solutions to the Boussinesq equation for water table drawdown. The use of an envelope wrap material will permit a somewhat wider drain spacing for all cases, with a large increase in spacing for the deeper profile. The allowable increase in spacing for both cases was relatively small, and the total system cost with the envelope wrap was about 6% higher than without the wrap for the shallow profile and about 7% lower for the deep profile. (Sims-ISWS)
W78-07087

A NEW MULTIVARIATE GAMMA DISTRIBUTION AND ITS FITTING TO EMPIRICAL STREAMFLOW DATA,
Technical Univ. of Budapest (Hungary). Dept. of Mathematics.
For primary bibliographic entry see Field 2E.
W78-07089

COMPARISON OF THE TWO- AND THREE-PARAMETER LOG NORMAL DISTRIBUTIONS USED IN STREAMFLOW SYNTHESIS,
Stanford Univ., CA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-07093

SECULAR WATER LEVEL FLUCTUATIONS IN THE LARGE NATURAL BODIES OF WATER OF KAZAKHSTAN AND SOVIET CENTRAL ASIA,
For primary bibliographic entry see Field 2H.
W78-07114

METHOD FOR SIMULATING RIVER RUNOFF STATISTICALLY,
For primary bibliographic entry see Field 2A.
W78-07115

CHARACTERISTICS AND CORRELATES OF PUBLIC KNOWLEDGE ABOUT A WATER RESOURCE DEVELOPMENT ISSUE,
Iowa State Univ., Ames. Dept. of Sociology and Anthropology.
For primary bibliographic entry see Field 6B.
W78-07126

APPLICATION OF LANDSAT DATA TO WETLAND STUDY AND LAND USE CLASSIFICATION IN WEST TENNESSEE,
Tennessee Univ. Space Inst., Tullahoma. Remote Sensing Div.
For primary bibliographic entry see Field 7B.
W78-07152

WATERFOWL POPULATIONS AS RELATED TO HABITAT CHANGES IN BOG WETLANDS OF THE MOOSEHORN NATIONAL WILDLIFE REFUGE,
Maine Cooperative Wildlife Research Unit, Orono.
S. I. Fefer.
Technical Bulletin 86, Life Sciences and Agriculture Experiment Station, University of Maine at Orono, August, 1977. 16 p, 7 fig, 5 ref.

Descriptors: *Marsh management, *Waterfowl, *Water levels, *Reproduction, Wetlands, Bogs, Marshes, Freshwater marshes, Wildlife management, Black duck, Ring-necked duck, Marsh plants, Water level fluctuations, Animal populations, Maine, *Moosehorn National Wildlife Refuge(Maine).

Fluctuating water levels, advanced plant succession, and an overall decrease in number and distribution of open water areas appear to be at least partly responsible for a general decline in the black duck population on the Refuge. Ring-necked duck numbers have increased on those Refuge wetlands where marsh management favored an increase in floating sedge-bog mat. By contrast, this species decreased on the shrub wetland flowages because of adverse effects on plant succession. It was concluded that maintenance of optimum water levels is the most important of all factors in marsh management on the Refuge. (Steiner-Mass)
W78-07164

HISTORICAL STREAMFLOW SUMMARY, ALBERTA, TO 1976.
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 7C.
W78-07165

IMPLEMENTATION OF THE TRANSFER PROCESS UNDER THE APPROPRIATION DOCTRINE,
For primary bibliographic entry see Field 6E.
W78-07199

4B. Groundwater Management

GEOHYDROLOGICAL ENVIRONMENTAL EFFECTS OF GEOTHERMAL POWER PRODUCTION - PHASE IIA,
Systems, Science and Software, La Jolla, CA.
For primary bibliographic entry see Field 5B.
W78-06701

ENVIRONMENTAL ASPECTS OF WATER SPREADING FOR GROUND WATER RECHARGE,
Agricultural Research Service, Fresno, CA. Water Management Research.
H. I. Nightingale, and W. C. Bianchi.
Available from USDA SEA Information Div, Hyattesville, MD, 20782. Technical Bulletin No. 1568, October, 1977. 21 p, 12 fig, 8 tab, 80 ref.

Descriptors: *Artificial recharge, *Groundwater recharge, *Water spreading, *Ecology, *Ecological distribution, *Aquatic plants, *Aquatic animals, Aquatic life, Aquatic habitat, California, Environmental effects, *Ecological impact, *Leaky Acres Recharge Facility, Fresno(CA).

Field observation data on the changes in the plant and animal communities during the first 5 years of operation of the Leaky Acres Recharge Facility in Fresno, California are presented. The original arid ecosystem has changed to aquatic with each continous recharge period of 8 to 10 months each year. The nature and magnitude of ecological changes were recorded as the aquatic environment was generated and stabilized; the impact of these changes on recharge and the surrounding urban area is discussed. Canal water quality parameters, soil chemical and physical properties, and geological parameters which are critical to maintaining the facility's infiltration rate of 16-23 cm/day are summarized. After 5 recharge periods, the ecosystem appears fairly stable in relation to the canal water quality, plant nutrients, and biota. Observations show that for the sandy soils the infiltration rate of the basins can be maintained by: (1) minimizing the amount of aquatic plant growth and resulting deposition of organic material that can cause biological clogging of the soil; (2) preventing turbid (greater than 20 FTU) canal water from carrying high loads of silt and clay from entering the basins; (3) preventing intrabasin erosion during filling; and (4) minimizing soil disking and compaction. A table of preconstruction surveys was formulated as a guide to generate information needed to write an intelligent and practical environmental impact report for a proposed basin-type recharge facility and to design and operate a recharge facility. (Seip-IPA)
W78-06764

A CASE OF CONTAMINATION OF KARST WATER-BEARING STRATA BY CHOLERA VIBRIO (IN RUSSIAN),
Nauchno-Issledovatelskii Protivochumnyi Inst., Rostov-na-Donu (USSR).
For primary bibliographic entry see Field 5B.
W78-06821

ESTIMATING TRANSMISSIVITY AND STORAGE COEFFICIENT FROM ABSTRACTION WELL DATA,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W78-06897

THE APPLICATION OF THE DIGITAL SIMULATION LANGUAGE PDEL TO SUBSURFACE HYDROLOGY PROBLEMS,
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 2F.
W78-06923

APPLICATION OF DIGITAL PROFILE MODELING TECHNIQUES TO GROUNDWATER SOLUTE TRANSPORT AT BARSTOW, CALIFORNIA,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-06931

A THEORETICAL BASIS FOR EXPLORATION FOR NATIVE COPPER IN NORTHERN WISCONSIN,
Geological Survey, Reston, VA. Geology Div.
W. S. White.
Available from Branch of Distribution, USGS 1200 S. Eads St. Arlington, VA 22202. Geological Survey Circular 769, 1978. 19 p, 5 fig, 36 ref.

Descriptors: *Copper, *Exploration, *Theoretical analysis, *Wisconsin, *Hydrothermal studies, Chemical reactions, Lava, Solubility, Mineralogy, Mining, Evaluation, *Buried groundwater, Deep lava beds(Wis).

Exploration for native copper in the Keweenawan lavas of northern Wisconsin has been concentrated in areas of relatively shallow overburden that have sparse to numerous outcrops. Lack of success of this exploration suggests that if large deposits, comparable to those of northern Michigan, are present, they are more likely to be found in one or more of the large tracts that have few, if any, exposures, away from the 'copper ranges.' A hydrologic model that may explain the mineralization of the classic native-copper district of Michigan could be helpful in suggesting that certain covered tracts are more favorable than others, and in narrowing the targets for physical exploration within these tracts. This model involves updip migration of a hydrothermal fluid of metamorphic origin, formed when ground water contained in the interstices of lava flows and conglomerate beds was carried to great depth along the axis of the Lake Superior syncline. The largest reservoirs of such buried ground water would be expected in the peripheral rather than central parts of the basins in which the lavas originally accumulated because the ratio of porous fragmental flow tops and conglomerate beds to massive basalt should increase towards the margins of a basin. Thus, the areas most promising for copper deposits should be those updip from places where the trough of the later formed Lake Superior syncline crosses the marginal parts of a lava basin. (Woodard-USGS)
W78-06938

GROUND-WATER RESOURCES OF THE NORTH BEACH PENINSULA, PACIFIC COUNTY, WASHINGTON,
Geological Survey, Tacoma, WA. Water Resources Div.
J. V. Tracy.
Open-file report 77-647, 1978. 45 p, 7 fig, 8 tab, 11 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Groundwater availability, *Water quality, *Washington, Hydrogeology, Hydrologic data, Observation wells, Water yield, Water level fluctuations, Groundwater recharge, Groundwater movement, Precipitation(Atmospheric), Water supply, Aquifer management, Well spacing, Projections, Evaluation, *North Beach Peninsula(Wash), Pacific County.

The anticipated water demand of 425 million gallons per year for the North Brach Peninsula, Pacific County, Wash., can be met by properly developing the ground-water supplies of the area's water-table aquifer. Of the approximately 77 inches of annual precipitation on the peninsula, an estimated 23 inches is lost to evapotranspiration, and approximately 36 inches is discharged by the water-table aquifer into the ocean and bay. The remaining water either runs off the surface or is leaked to a deeper aquifer that ultimately discharges to the ocean. At least 12 inches of the water that discharges naturally through the aquifer is available for additional development. This quantity of water is approximately equivalent to 860,000 gallons per day. Wells spaced at least 1,000 feet apart along the major axis of the peninsula and pumped at average rates of no more than 80 gallons per minute could ensure that water-level declines do not exceed 6 feet near the wells and 1 foot at the shoreline, thereby preventing seawater intrusion. Lowering of the water table may be beneficial in reducing waterlogging problems, but care must be taken not to lower the levels near cranberry bogs, which require a shallow water table. Treatment of the otherwise good quality water for iron may be required, as about 75 percent of the well water sampled from the aquifer had iron concentrations in excess of limits recommended by the U.S. Environmental Protection Agency. (Woodard-USGS)
W78-06941

EVALUATION OF HYDROGEOLOGIC ASPECTS OF PROPOSED SALINITY CONTROL PROGRAM IN PARADOX VALLEY, COLORADO,
Geological Survey, Denver, CO. Water Resources Div.
For primary bibliographic entry see Field 5G.
W78-06942

MODEL ANALYSIS OF THE IMPACT ON GROUND-WATER CONDITIONS OF THE MUSKEGON COUNTY WASTEWATER DISPOSAL SYSTEM, MICHIGAN,
Geological Survey, Lansing, MI. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-06943

THE USE OF TEMPERATURE LOGS TO TRACE THE MOVEMENT OF INJECTED WATER,
Geological Survey, Denver, CO. Water Resources Div.; and Geological Survey, Anchorage, AL. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-06945

REVIEW OF AUSTRALIA'S WATER RESOURCES 1975,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-06947

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1976--VOLUME 1. NORTHEAST FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06952

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1976--VOLUME 2. SOUTH FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06953

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1976--VOLUME 4. NORTHWEST FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06954

OVERVIEW OF FEDERAL GROUNDWATER PROTECTION LEGISLATION AIDS ENVIRONMENTALISTS,
Office of Radiation Programs, Washington, DC. Div. of Criteria and Standards.
For primary bibliographic entry see Field 5G.
W78-06956

DEPLETION ALLOWANCE FOR GROUNDWATER MINING: PROS AND CONS,
Texas Dept. of Water Resources, Austin.
T. Knowles, and F. Rayner.
Journal American Water Works Association, Vol. 70, No. 3, p 148-150, March, 1978. 2 fig.

Descriptors: *Taxes, *Texas, *Overdraft, *Groundwater mining, Water table, Irrigation, Withdrawal, Aquifers, Water conservation, Water resources development.

Although Texas is blessed with a vast amount of ground water from several major aquifers (328 million recoverable acre-feet, according to recent estimates), pumpage far exceeds recharge on a statewide basis. Declining water levels of the Ogallala aquifer in the High Plains have been a source of concern for many years. Because the majority of ground water used in the area is for irrigating cotton and feed grains, and because Texas landowners by law own the ground water beneath their acreage, the High Plains Underground Water Conservation District No. 1 has sought, and utlimately obtained, a cost depletion tax allowance for declining water tables. The final court decision which approved the allowance took into account that farmers are paying bonuses for land with proven ground water reserves. Water is thus viewed as a valuable capital item. It was further reasoned that the tax benefits should be a force in bringing the value of ground water resources to the forefront of public awareness. (Eberle-NWWA)
W78-06957

A SURVEY OF PRACTICES AND REGULATIONS FOR REUSE OF WATER BY GROUNDWATER RECHARGE,
SCS Engineers, Long Beach, CA.
For primary bibliographic entry see Field 5D.
W78-06958

UPDATE ON GEOTHERMAL DRILLING,
For primary bibliographic entry see Field 8C.
W78-06962

SICK WELLS REQUIRE WELL DEVELOPED CURE.
For primary bibliographic entry see Field 5G.
W78-06963

AN INTRODUCTION TO THE TECHNOLOGY OF SUBSURFACE WASTEWATER INJECTION,
Missouri Univ.-Rolla; and National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 5E.
W78-06965

CHARACTERISTICS OF VAPOR FLASHING GEOTHERMAL PLANTS,
Hawaii Univ., Honolulu. Coll. of Engineering.
For primary bibliographic entry see Field 8C.
W78-06966

GEOTHERMAL RESERVOIR AND WELL TEST ANALYSIS: A LITERATURE SURVEY,
Hawaii Univ.-Hilo Coll., Hilo.
For primary bibliographic entry see Field 8B.
W78-06967

A REVIEW OF PROBLEMS ON SCALING AND CORROSION IN GEOTHERMAL PLANTS,
Hawaii Univ., Honolulu. Coll. of Engineering.
For primary bibliographic entry see Field 8G.
W78-06968

REGIONAL GEOLOGY SERIES: PART III, UNGLACIATED APPALACHIAN REGION,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 2F.
W78-06970

APPLICATION OF BOREHOLE GEOPHYSICS TO SELECTION OF POTENTIAL SITES FOR DEEP-WELL DISPOSAL OF LIQUID WASTES,
For primary bibliographic entry see Field 5E.
W78-06972

GROUNDWATER QUALITY AND CORROSION: THE AUSTRALIAN SCENE,
For primary bibliographic entry see Field 5B.
W78-06973

LEGISLATIVE ASPECTS OF GROUNDWATER QUALITY,
For primary bibliographic entry see Field 5G.
W78-06974

MEASURES FOR THE PROTECTION AND REHABILITATION OF AQUIFERS IN THE UNITED KINGDOM,
For primary bibliographic entry see Field 5G.
W78-06975

PUBLIC GROUNDWATER SUPPLIES IN EDWARDS COUNTY,
Illinois State Water Survey, Urbana.
D. M. Waller, and E. W. Sanderson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 309, Price codes: A02 in paper copy, A01 in microfiche. Bulletin 60-21, 1978. 8 p, 1 fig.

Descriptors: *Water supply, *Illinois, *Groundwater resources, *Well data, Unconsolidated aquifers, Gravels, Sand aquifers, Groundwater, Groundwater availability, Hydrology, Hydrogeology, Water sources, Water quality, Water wells, Municipal water, Water yield, Water properties, Hardness(Water), Chemical properties, Shallow wells, Geology, *Edwards County(Ill), Dissolved minerals, Water bearing formations.

All available information was reported on production wells used for public groundwater supplies in Edwards County. The definition of public water supply as contained in the Environmental Protection Act of 1970 was used to determine those water systems and wells to be included. Sand and gravel deposits in the unconsolidated materials above bedrock in Edwards and Wabash Counties are tapped as the source of municipal water supply. There are presently 8 public supply production wells (2 in Edwards and 6 in Wabash), ranging in depth from 42.8 to 91.6 ft, finished in the sand and gravel deposits. Reported yields range from 29.8 to 502 gpm, depending primarily upon the type of well and the permeability, thickness, and areal extent of the sand and gravel deposits tapped by each well. Past and present analyses of water rom the 3 public water supply systems indicated that the iron content ranges from 0.1 to 6.6 mg/l, and the hardness from 277 to 430 mg/l. Individual production wells for each supply were described in the order of their construction. The description for each well included the aquifer tapped, date drilled, depth, driller, legal location, elevation in feet above mean sea level, log, construction features, yield, pumping equipment, and chemical analyses. (Humphreys-ISWS)
W78-07085

AN APPROXIMATE DIFFERENTIAL EQUATION TO DESCRIBE LEAKY AQUIFER BEHAVIOR DURING INTERMEDIATE AND LARGE VALUES OF TIME,
Universidad Nacional Autonoma de Mexico, Mexico City. Dept. of Ingeniera.
For primary bibliographic entry see Field 2F.
W78-07090

TO MINE OR NOT TO MINE GROUNDWATER,
Illinois State Water Survey, Urbana.
R. T. Sasman, and R. J. Schicht.
Journal of the American Water Works Association, Vol. 70, No. 3, p 156-161, March 1978. 3 fig, 5 tab, 8 ref.

Descriptors: *Groundwater, *Groundwater mining, *Illinois, *Lake Michigan, Water resources, Water supply, Water demand, Water law, Water resources development, Water management(Applied), Aquifers, Pumping, Storage, Recharge, Precipitation(Atmospheric), Costs, Planning, *Chicago metropolitan region(Ill).

Although continued or expanded mining of groundwater is an attractive means of increasing water supply to meet the demands of growing populations in many areas of the US, it also can be a debatable issue. Based on a series of studies by the Illinois State Water Survey, the advantages and disadvantages of groundwater mining in the Chicago metropolitan region were discussed, with emphasis on such yet-to-be-resolved questions as the extent and sources of recharge, impact on water quality, and the availability and cost of alternate sources of supply. (Sims-ISWS)
W78-07102

STATUS OF GROUNDWATER CONTAMINATION IN THE US,
Geraghty and Miller, Inc., Tampa, FL.
For primary bibliographic entry see Field 5B.
W78-07103

THE EFFECTS OF SOLID WASTE LANDFILL LEACHATES ON RECEIVING WATERS,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-07104

A CASE HISTORY TO EVALUATE THE PERFORMANCE OF WATER-SPREADING PROJECTS,
Agricultural Research Service, Fresno, CA. Water Management Research.
W. C. Bianchi, H. I. Nightingale, and R. L. McCormick.
Journal of the American Water Works Association, Vol. 70, No. 3, p 176-180, March 1978. 4 fig, 6 tab, 12 ref.

Descriptors: *Recharge, *Artificial recharge, *California, Groundwater recharge, Pit recharge, Recharge ponds, Performance, Evaluation, Groundwater, Infiltration, Percolation, Evaporation, Costs, Economics, Water management(Applied), Hydrologic properties, Projects, Aquifers, Groundwater, *Water spreading, *Fresno(Calif), *Leaky Acres recharge project(Calif).

Studies on ways to predict the performance, costs, and benefits of artificial groundwater recharge were made for the Fresno, California, Leaky Acres Project. Prediction errors of site recharge rates were as much as 20 times greater than the final operational project rate when soil cores were used, while pilot spreading with proper instrumentation for sublayer perching decreased estimates to within 1.5 times. Recharge costs are difficult to evaluate on a user-benefit basis. Using a zonal response and political boundary approach, 79% of the benefit of recharge benefited city users. The use of the recharge water, however, requires an energy-consuming process, and energy costs soon will equal the operational costs of recharge. (Sims-ISWS)
W78-07105

WATER QUALITY AT A SLUDGE ENTRENCHMENT SITE,
Agricultural Research Service, Beltsville, MD. Soil Nitrogen Lab.
For primary bibliographic entry see Field 5B.
W78-07110

REMOTE SENSING DETECTS GROUNDWATER IN ENGLAND,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 7B.
W78-07112

SUBSURFACE WASTE DISPOSAL IN LAMBTON COUNTY, ONTARIO - PIEZOMETRIC HEAD IN THE DISPOSAL FORMATION AND

GROUNDWATER CHEMISTRY OF THE SHALLOW AQUIFER,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 5E.
W78-07166

AN UNUSUAL PUMP TEST NEAR ESTERHAZY, SASKATCHEWAN,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 5G.
W78-07172

4C. Effects On Water Of Man's Non-Water Activities

HIGHWAY OPERATION AND PLANT DAMAGE,
California State Dept. of Transportation, Sacramento. Transportation Lab.
For primary bibliographic entry see Field 5B.
W78-06725

HIGHWAYS IN THE RIVER ENVIRONMENT-HYDRAULIC AND ENVIRONMENTAL DESIGN CONSIDERATIONS (TRAINING AND DESIGN MANUAL),
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-06730

URBAN CHANNEL EROSION: PRELIMINARY ANALYSIS,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 4D.
W78-06810

NONSTATIONARY STREAMFLOW FROM URBANIZING WATERSHEDS: A CASE STUDY,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
T. E. Croley, II, R. N. Eli, and K-K. Shih, II.
Report presented at the ASCE Hydraulics Division 23rd Annual Specialty Conference, 'Hydraulic Engineering for Optimal Use of Water Resources,' August 6-8, 1975, Seattle, Washington, 30 p, 5 fig, 9 tab, 5 ref. OWRT A-053-IA (3).

Descriptors: *Flood forecasting, *Urbanization, *Stream flow, *Model studies, *Iowa, Economics, Urban hydrology, Precipitation(Atmospheric), Simulation analysis, *Ralston Creek watershed(Iowa), Non-stationary streamflow, Rural hydrology.

The streamflow record, precipitation record, and characteristics of the Ralston Creek watershed, Iowa City, Iowa, are used to estimate parameters for streamflow simulation models for both non-urban and urban conditions. In preparation for estimating urbanization-induced flood hazards, the models are combined in a data generation approach designed to estimate flood characteristics for both urban and non-urban conditions. Preliminary estimation of the flood hazard impact is presented and economic estimations are made. (Seip-IPA)
W78-06823

CHICAGO AREA PROGRAM: A MAJOR NEW ATMOSPHERIC EFFORT,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W78-06885

STRESS AND RECOVERY OF AQUATIC ORGANISMS AS RELATED TO HIGHWAY CONSTRUCTION ALONG TURTLE CREEK, BOONE COUNTY, WEST VIRGINIA,
Geological Survey, Charleston, WV. Water Resources Div.
J. L. Chisholm, and S. C. Downs.
Available from the Supt. of Documents, GPO, Washington, DC 20402, Price $1.60. Water-Supply Paper 2055, 1978. 40 p, 22 fig, 6 tab, 9 ref.

Descriptors: *Ecosystems, *Environmental effects, *Aquatic life, *Road construction, *West Virginia, Streams, Sediment transport, Water quality, Sampling, Benthos, Analytical techniques, Drainage area, Channel morphology, Vegetation regrowth, Evaluation, *Boone County(W Va), Turtle Creek, Organism drift, Total count, Organism recovery.

During and after construction of Appalachian Corridor G, a divided, four-lane highway in West Virginia, five benthic invertebrate samples were collected at each of four sites on Turtle Creek, and, for comparative purposes, three samples were collected at each of two sites on Lick Creek, an adjacent undisturbed stream. Diversity index, generic count, and total cout initially indicated severe depletion or destruction of the benthos of Turtle Creek, but, within 1 year after highway construction was completed, the benthic community of Turtle Creek was similar to that of Lick Creek. The greatest degradation occurred near the headwaters of Turtle Creek because of erratic movement of sediment resulting from high streamflow velocity. Diversity indices ranged from 0 to 3.41 near the headwaters in the original channel, but only from 0.94 to 2.42 farther downstream in a freshly cut channel. The final samples from Turtle Creek, which were similar to those taken from Lick Creek at the same time, had generic counts of 10 at the most upstream site and 16 near the mouth. A total of 147 organisms was found near the headwaters, whereas a total of 668 was found near the mouth of the stream. The total number of organisms collected at each site was proportional to the drainage area upstream from the site. As a result of tributary inflow from unaltered drainage areas and organism drift, rapid repopulation and stabilization of the benthic community occurred. Channel relocation, bank recontouring, and reseeding also accelerated the recovery of the benthic community. (Woodard-USGS)
W78-06933

WASHINGTON, D.C.'S VANISHING SPRINGS AND WATERWAYS,
Geological Survey, Lakewood, CO. Water Resources Div.
G. P. Williams.
Available from Branch of Distribution, USGS 1200 S. Eads St. Arlington, VA 22202. Circular 752, 1977. 19 p, 3 fig, 1 tab, 49 ref.

Descriptors: *History, *District of Columbia, *Streams, *Springs, *Urbanization, Environmental effects, Boats, Canals, Harbors, *Washington(DC).

This paper traces the disappearance or reduction of the many prominent springs and waterways that existed in Washington, D.C., 200 years ago. The best known springs were the Smith Springs (now under the McMillan Reservoir), the Franklin Park Springs (13th and I Streets, NW.), Gibson's Spring (15th and E Streets, NE.), Caffrey's Spring (Ninth and F Streets, NW.), and the City Spring (C Street between Four and One-Half and Sixth Streets, NW.). Tiber Creek, flowing south to the Capitol and thence westward along Consititution Avenue, joined the Potomac River at 17th Street and Constitution Avenue. In the 1800's, the Constitution Avenue reach was made into a canal which was used by scows and steamboats up to about 1850. The canal was changed into a covered sewer in the 1870's, and the only remaining visible surface remnant is the lock-keeper's little stone house at 17th and Constitution Avenue, NW. Because of sedimentation problems and reclamation projects, Rock Creek, the Potomac River, and the Anacostia River are considerably narrower and shallower today than they were in colonial times. For example, the mouth of Rock Creek at one time was a wide, busy ship harbor, which Georgetown used for an extensive foreign trade, and the Potomac River shore originally extended to 17th and Constitution Avenue, NW. (Woodard-USGS)
W78-06937

USE OF A PIECEWISE LINEAR MODEL WITH SPATIAL STRUCTURE AND INPUT FOR EVALUATING AGRICULTURAL TO URBAN HYDROLOGIC IMPACT,
Agricultural Research Service, Athens, GA. Southwest Watershed Research Center.
For primary bibliographic entry see Field 2A.
W78-07061

SOIL DISTRUBANCE CAUSED BY SKYLINE CABLE LOGGING ON STEEP SLOPES IN WEST VIRGINIA,
Northeastern Forest Experiment Station, Parson, WV. Timber and Watershed Lab.
J. H. Patric, and J. L. Gorman.
Journal of Soil and Water Conservation, Vol. 33, No. 1, p 32-35, January-February 1978. 3 fig, 14 ref.

Descriptors: *Soil erosion, *Lumbering, *Forest management, *West Virginia, Forestry, Forest watersheds, Erosion control, Trees, Forests, Hardwood, Soil horizons, Infiltration, On-site investigations, *Skyline cable logging.

A URUS mobile skyline system removed an average volume of 32.6 cu m (4,500 board measure) per hectare of hardwood logs from 16 hectares (40 acres) of steep forest land in West Virginia. Six months after logging, the areas's hydrologic performance was evaluated. There was no evidence of reduced infiltration, increased bulk density, overland flow, or accelerated erosion, except on heavily used skid trails. The soil was severely disturbed (B horizon exposed) on less than 3% of the logged land; more than 90% was undisturbed. (Humphreys-ISWS)
W78-07109

SURVEY OF ALTERNATIVES TO THE USE OF CHLORIDES FOR HIGHWAY DEICING,
Federal Highway Administration, Washington, DC. Materials Div.
J. A. Zenewitz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 110, Price codes: A03 in paper copy, A01 in microfiche. Report No. FHWA-RD-77-52, May, 1977. 23 p, 45 ref.

Descriptors: *Ice, *Melting, *Deicers, *Highway icing, Chemicals, Testing, *Chlorides, Reviews.

The results of a state-of-the-art review of highway deicing techniques are summarized. Information and suggestions for use in planning and initiating research are included. A literature review and a compilation of information from various organizations have promoted selections of and suggestions for promising avenues of research into alternatives to the use of chlorides. These alternatives include: (1) formamide, (2) urea, (3) tetrapotassium pyrophosphate, (4) formamide-urea-water, (5) tripotassium phosphate-formamide, (6) hydrolysates of proteinaceous waste, (7) hydrophobic coatings - such as fatty-quaternary-ammonium compounds, organo-fluorochemical compounds, organo-silicone compounds, polymers (polyethylene, plastics, aminoborane, alkali metal borohydride, alkali metals with borohydrides), (8) pavement heating, (9) mobile thermal deicing, (10) ultrasonic or vibrational techniques, and (11) various types of equipment. Undesirable characteristics are noted with the use of: ammonium acetate, ammonium nitrate, ammonium sulfate, alcohols, glycols, sodium formate, calcium formate, ammonium carbamate, and ammonium salts. (Seip-IPA)
W78-07122

ENVIRONMENTAL IMPACT OF LAND USE ON WATER QUALITY (PROGRESS REPORT), BLACK CREEK PROJECT, ALLEN COUNTY, INDIANA,
Allen County Soil and Water Conservation District, Fort Wayne, IN.
For primary bibliographic entry see Field 6G.
W78-07131

4D. Watershed Protection

EROSION RATES OF COHESIVE SOILS,
Nielsen Engineering and Research Inc., Mountain View, CA.
For primary bibliographic entry see Field 2J.
W78-06720

METHODS OF SOIL STABILIZATION FOR EROSION CONTROL,
Purdue Univ., Lafayette, IN. School of Civil Engineering.
S. Diamond.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 922, Price codes: A04 in paper copy, A01 in microfiche. Report JHRP-75-20, October 1975. 57 p, 7 fig, 9 ref.

Descriptors: *Erosion control, *Rainfall, *Slopes, *Laboratory tests, Cements, Portland cements, Lime, Dusts, Erosion, Storms, Stabilization, Construction, Sediments, Soils, Clays, *Construction soil erosion, Cement plant dusts.

The objective was to investigate the possible application of inexpensive soil stabilization treatments for the purpose of reducing or preventing soil erosion on construction sites and consequent downstream sediment problems. Treatments were evaluated by measuring erosion loss of treated soil specimens exposed to a severe standardized rainfall test sequence. Treatments investigated included modest percentages of portland cement, hydrated lime, or waste cement plant dust incorporated with the soil by mixing and compaction, or by application in slurry form over the surface of previously compacted specimens. It was found that all of the stabilizers used in reasonable amounts (1 to 2.5%) would almost completely eliminate erosion in the test rainstorm sequence. Required curing periods apparently were conditioned by the level of compaction exerted; in favorable cases, only 1-3 days were required, particularly with portland cement treatment. Hydrated lime and cement dust treatments, while eventually equally successful in preventing erosion in the standard test, required longer curing times, especially when the specimens were only lightly compacted. Waste cement dust may be a promising additive in view of its negligible materials cost. (Sims-ISWS)
W78-06724

HIGHWAYS IN THE RIVER ENVIRONMENT--HYDRAULIC AND ENVIRONMENTAL DESIGN CONSIDERATIONS (TRAINING AND DESIGN MANUAL),
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-06730

NEW REQUIREMENTS FOR LOCAL UNITS OF GOVERNMENT IN WATER RESOURCES PLANNING: INSIGHTS FOR IMPLEMENTA-

TION FROM RECENT WATER RESOURCES PLANNING RESEARCH,
Say (E. W.) and Associates, Inc., Chelsea, MI.
For primary bibliographic entry see Field 6E.
W78-06742

SHORELINE ECOLOGY OF LAKE POWELL,
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 2H.
W78-06773

POLITICS OF SHORE EROSION: WESTHAMPTON BEACH,
State Univ. of New York at Albany. Graduate School of Public Affairs.
For primary bibliographic entry see Field 6E.
W78-06776

WASHINGTON COUNTY PROJECT WORK PLAN: DEVELOPMENT AND IMPLEMENTATION OF SEDIMENT CONTROL ORDINANCE OR OTHER REGULATORY MECHANISM: INSTITUTIONAL ARRANGEMENTS NECESSARY FOR IMPLEMENTATION OF CONTROL METHODOLOGY ON URBAN AND RURAL LANDS,
Wisconsin Board of Soil and Water Conservation Districts, Madison.
T. C. Daniel, and R. H. Klassy.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 189, Price codes: A05 in paper copy, A01 in microfiche. Prepared for U.S. Environmental Protection Agency, Office of Great Lakes Coordinator, Chicago, IL, January 1977, 73 p, 7 tab, 16 fig. 6005139.

Descriptors: *Sediment control, *Land use, *Regulation, *Water quality monitoring, *Erosion control, *Wisconsin, Planning, Economics, Management, Institutions, Rural areas, Urbanization, Washington County(WI), Public participation.

The study's purpose was to demonstrate the development of a regulatory mechanism for sediment control in Washington County, Wisconsin, in order to improve water quality. Sediment problems arising from both urbanization--industrial and residential development--and rural land uses were investigated. Of particular interest was the nexus between land control and the improvement of water quality and the institutional arrangements necessary to insure that quality. Recommended was a county-wide management plan that integrated to considerations of both rural and urban land use. Public participation was encouraged along with an effective economic feasibility study of plan implementation. Monitoring sites throughout the county were also selected. (Zayac-NC)
W78-06780

URBAN CHANNEL EROSION: PRELIMINARY ANALYSIS,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
W. Whipple, Jr., and T. Pytlar, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 952, Price codes: A02 in paper copy, A01 in microfiche. Partial Completion Report, April 1978. 19 p, 8 fig, 1 tab, 20 ref. OWRT B-067-NJ(1), 14-34-0001-8100.

Descriptors: *Channel morphology, *Erosion control, *Erosion, *Stream stabilization, *Urban runoff, *Urbanization, *Storm runoff, *Culverts, *Environmental effects, Engineering structures, Channels, Bank stability, Urban drainage, Channel erosion, Channel improvement.

Erosional aspects of urban stream were investigated. Analysis of existing stream and drainage basin data and on-site observations of twelve New Jersey streams have been aimed at identifying the variables related to excess urban storm runoff and stream erosion. Preliminary results indicate that measures of land use, stream slope, geology, and drainage basin area are most useful in explaining the degree of channel erosion. In addition, culvert size with respect to storm flow, and artificial drainage via pipes into the streams may play an important role in the process. Bed load transport and other hydraulic relationships will be used to formulate quantitative criteria which can be used by local agencies to manage urban streams so as to avoid channel degradation and the eventual necessity of concrete lining and channelization of the streams in urban settings.
W78-06810

NONSTATIONARY STREAMFLOW FROM URBANIZING WATERSHEDS: A CASE STUDY,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 4C.
W78-06823

UTILIZING CLIMATIC DATA TO APPRAISE POTENTIAL WATER YIELDS,
Kansas Univ., Lawrence. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W78-06850

U. S. PROGRAMS IN RESEARCH DRAINAGE BASINS--AN INTERIM ASSESSMENT.
National Research Council, Washington, DC.
For primary bibliographic entry see Field 2A.
W78-06873

A DISTRIBUTED KINEMATIC MODEL OF UPLAND WATERSHEDS,
Colorado State Univ., Fort Collins.
E. W. Rovey, D. A. Woolhiser, and R. E. Smith.
Hydrology Paper No. 93, July 1977. 58 p, 48 fig, 11 tab, 64 ref, 2 append. USDA and Colorado Experiment Station ES114.

Descriptors: *Model studies, *Infiltration, *Storm drains, *Analytical techniques, *Routing, Urban runoff, Watersheds(Basins), Parametric hydrology, Hydrographs, Storms, Computer programs, *Kinematic model, Impervious experimental facility, Spatial variability.

Relationships were developed to compute flows by the kinematic approximation in channels of circular cross section for routing of flow through storm drains. A parametric decay-type infiltration function was incorporated into the surface routing model. The kinematic routing was shown to yield hydrographs comparable to those with the lag method for predicting outflows. The model was used to simulate runoff from 2 urban watersheds. Results from the small, impervious watershed showed good agreement between observed and predicted hydrographs. Results from the large, complex urban watershed were good when the rainfall excess is properly estimated. A computer program of a general kinematic watershed model was presented. The program can be used to predict hydrographs of individual storms for small rural and urban watersheds. (Singh-ISWS)
W78-06876

CONTROL OF TURBIDITY AT CONSTRUCTION SITES.
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 5G.
W78-06904

WATER-QUALITY INVESTIGATION OF THE TYRONZA RIVER WATERSHED, ARKANSAS,
Geological Survey, Little Rock, AR. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-06951

SOIL CHANGES AFTER HAY MEADOW ABANDONMENT IN SOUTHWESTERN WISCONSIN,
North Central Forest Experiment Station, St. Paul, MN.
M. D. Knighton.
USDA For. Serv. Res. Pap. NC-146, 1977. 6 p, 3 fig, 1 tab, 14 ref.

Descriptors: *Soil management, *Soil dynamics, *Erosion control, Infiltration, Soil physical properties, Porosity, Bulk density, *Wisconsin, *Driftless area, Typic hapludolf, Fayette silt loam, Organic carbon.

Soil properties were monitored in early spring and late fall for 3 years following hay meadow abandonment. Bulk density decreased, organic carbon increased, total porosity increased in the large pore fraction, and infiltration rate increased 100%. Earthworm activity was considered to be primarily responsible for the improvement. (Forest Service)
W78-06978

PENN STATE RUNOFF MODEL FOR THE ANALYSIS OF TIMING OF SUBWATERSHED RESPONSE TO STORMS,
Weston (Roy F.), Inc., West Chester, PA.
For primary bibliographic entry see Field 5G.
W78-07060

USE OF A PIECEWISE LINEAR MODEL WITH SPATIAL STRUCTURE AND INPUT FOR EVALUATING AGRICULTURAL TO URBAN HYDROLOGIC IMPACT,
Agricultural Research Service, Athens, GA. Southwest Watershed Research Center.
For primary bibliographic entry see Field 2A.
W78-07061

PHYSICAL MANAGEMENT OF COASTAL FLOOD PLAINS: GUIDELINES FOR HAZARDS AND ECOSYSTEMS MANAGEMENT.
Conservation Foundation, Washington, DC.
For primary bibliographic entry see Field 6G.
W78-07077

SOIL DISTRUBANCE CAUSED BY SKYLINE CABLE LOGGING ON STEEP SLOPES IN WEST VIRGINIA,
Northeastern Forest Experiment Station, Parson, WV. Timber and Watershed Lab.
For primary bibliographic entry see Field 4C.
W78-07109

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

CONTENT OF SOME HEAVY METALS IN THE NATURAL WATERS OF THE SOUTHERN PART OF EASTERN TRANSBAYKALIA,
Irkutsk Gosudarstvennyi Univ. (USSR).
For primary bibliographic entry see Field 5B.
W78-06712

URANIUM IN RIVER RUNOFF,
Akademiya Nauk SSSR. Moscow. Inst. Okeanologii.
For primary bibliographic entry see Field 5B.
W78-06713

SHELL GROWTH OF UNFED OYSTERS IN THE LABORATORY: A SUBLETHAL BIOASSAY SYSTEM FOR POLLUTANTS,
Maryland Univ., College Park. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W78-06750

METHYLMERCURY: FORMATION IN PLANT TISSUES,
Environmental Protection Agency, Las Vegas, NV. Office of Research and Development.
D. D. Gay.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 096, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA - 600/3-76-049, May, 1976. 29 p, 2 fig, 6 tab, 102 ref.

Descriptors: *Mercury, *Plant physiology, *Plant tissues, *Adsorption, Tracer elements, Incubation, *Gas chromotography, Analytical techniques, *Pollutant identification, *Peas, *Methylmercury, *Mercury uptake, Plant chemistry, Mercuric nitrate, Phenylmercury, Phenylmercury acetate.

Methylmercury (CH_3Hg) is identified as one of the mercury species present in the tissue of pea plants (Pisum sativum). Methylmercury was formed by the plants (1) when grown in vermiculite and the leaves sprayed with as little as 90 ml of 10 micrograms/gram of mercuric nitrate ($Hg(NO_3)_2$), (2) when grown in soil with mercuric nitrate or phenylmercury added, or (3) when sections of the pea plants were surface-sterilized with 5% Chlorox or Gentamicin added to the incubation medium and incubated 20 hours in 10 micrograms/gram phenylmercury acetate. The age of the peas plays a role in the amount of methylmercury formed; older pea tissues produce less methylmercury than young tissues when these tissues are infiltrated and incubated with 10 micrograms/gram of mercuric nitrate. Samples of 3 species of plants (Bromus rubens, Spharalcea ambigua, and Boraginaceae) were collected around an abandoned mercury mine; all three species showed the presence of methylmercury but the influroescence of Bromus rubens was especially high in methylmercury. (See also W77-03006) (Seip-IPA)
W78-06753

RED RIVER CHLORIDE REMOTE SENSING STUDY: FINAL REPORT.
Army Engineer District, Tulsa, OK.
For primary bibliographic entry see Field 7B.
W78-06768

INTRODUCTION TO INSTRUMENTAL ANALYSIS OF WATER POLLUTANTS: TRAINING MANUAL.
Environmental Protection Agency, Cincinnati, OH. Office of Water Program Operations.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 318, Price codes: A08 in paper copy, A01 in microfiche. Report No EPA-430/1-75-011, November, 1976. 161 p, 73 fig, 28 tab, 98 ref.

Descriptors: *Water quality, *Instrumentation, *Water analysis, *Pollutant identification, *Analytical techniques, Design, Operations, Quality control, Dissolved oxygen analyzers, Color reactions, Conductivity, Hydrogen ion concentration, Flame photometry, Spectrometry, Turbidity, Gas chromatography, Training, Atomic absorption spectrophotometry, Total organic carbon, Training manual.

A training manual is presented as an accompaniment to EPA National Training Center Course 107.1, 'Introduction to Instrumental Analysis of Water Pollutants.' It includes the principles utilized, basic design, analytical applications, operational procedures, and quality control aspects for each of the instruments most commonly used in water analysis. The instruments described are: pH meter, conductivity meter, dissolved oxygen probe, colorimeter, flame photometer, infrared spectrophotometer, atomic absorption spectrophotometer, turbidimeter, total organic carbon analyzer, and gas chromatograph. (Seip-IPA)
W78-06769

BENCHMARK ESTABLISHMENT AND WATER QUALITY MONITORING IN THE BRIDGEPORT AND BLACK ROCK HARBOR SYSTEMS,
Higher Education Center for Urban Studies, Bridgeport, CT.
C. J. Verses, R. J. Chriss, and W. T. Gnewuch.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 735, Price codes: A04 in paper copy, A01 in microfiche. Prepared for Department of Housing and Urban Development, Washington, D.C., Policy Development and Research, July 1976, 60 p, 31 tab, 6 ref, 3 append. H-2196R.

Descriptors: *Monitoring, *Waste water(Pollution), Waste water disposal, Waste water treatment, Nitrates, Phosphates, Ammonia, Dredging, Sediments, Storm runoff, Water quality, Water sampling, Harbors, *Harbor waters, Fecal coliforms, Bridgeport(CN).

Investigations were undertaken in the summer of 1975 in order to establish a suitable monitoring system for the harbor wters of Bridgeport, Connecticut. Sought were general water quality data and sites for testing and future monitoring. Three of the eight sites selected for future monitoring showed signs of least moderate to severe degradation, study results indicating these areas to have unusually high fecal coliform counts as well as high concentrations of nitrate, ammonia and phosphates. Three recommendations ensued: (1) begin dredging studies to remove bottom sediments; (2) modify the wastewater treatment network to include provisions for handling excess storm runoff; and (3) continue monitoring domestic and industrial wastewater flows. (Zayac-NC)
W78-06787

A TOXONOMIC STUDY OF THE SPONGILLA ALBA, S. CENOTA, S. WAGNERI SPECIES GROUP (PORIFERA: SPONGILLIDAE) WITH ECOLOGICAL OBSERVATIONS OF S. ALBA,
New Orleans Univ., LA. Dept. of Biological Sciences.
M. A. Poirrier.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 154, Price codes: A02 in paper copy, A01 in microfiche. In: Aspects of Sponge Biology, p 203-213, 1976. Academic Press, New York, New York. 3 fig, 1 tab, 23 ref. OWRT A-035-LA(2).

Descriptors: *Water quality, *Systematics, Ecology, Ecological distribution, Environment, Water pollution, Municipal wastes, Water pollution sources, Indicators, Biology, Louisiana, *Bioindicators, Pollutant identification, *Lake Ponchartrain(LA), *Sponges, Spongilla alba.

The taxonomy of the fresh water sponges, Spongilla alba, S. cenota, and S. wagneri was studied, concluding that S. wagneri Potts (1889) is synonymous with S. alba Carter (1849). Ecomorphic variation in S. lacustris was discussed, and its morphology was compared to that of S. alba and S. cenota Penny and Racek (1968). The ecology of S. alba in Lake Pontchartrain, Louisiana, was investigated; findings were: (1) an annual life cycle; (2) gemmules hatched in the spring; (3) growth and sexual reproduction occurring during the summer; (4) gemmules formed in the fall; and (5) gemmules remaining dormant during the winter. Various physicochemical parameters of S. alba's habitat were investigated; it appears to be a good water-qualit indicator species because it once occurred throughout Lake Pontchartrain, but in recent years has been absent from areas affected by storm water discharge from metropolitan New Orleans, Louisiana. The presence of S. alba in oligohaline waters in North America and prior widespread records from similar habitats on other continents indicate that it probably occurs in such habitats in tropical and subtropical environments throughout the world. S. cenota, previously known only from Yucatan, Mexico, was reported from southern Florida. Use of sponges as water quality indicators is discussed. (Wares - IPA)
W78-06805

VIRAL MONITORING OF WASTEWATER AEROSOLS,
Michigan Univ., Ann Arbor. Dept. of Epidemiology.
K. W. Cochran, and K. F. Fannin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 155, Price codes: A03 in paper copy, A01 in microfiche. Project Completion Report, December, 1976. 32 p, 21 tab, 47 ref, 2 append. OWRT A-088-MICH(1). 14-31-0001-6023.

Descriptors: *Viruses, *Coliforms, *E coli, *Aerosols, *Activated sludge, *Trickling filters, *Bioindicators, Indicators, *Air pollution, Waste water treatment, Sewage treatment, Analytical techniques, *Pollutant identification, Airborne animal viruses, *Coliphages, Aerosol emissions, *Spray irrigation, *Sludge land application.

Trickling filter, activated sludge, and spray irrigation wastewater treatment plants were compared for concentrations of airborne animal viruses and coliphages in aerosol emissions. Emissions from a spray irrigation plant and a sludge application to land site are analyzed; the significant results relating to viable aerosol emissions from trickling filter and activated sludge plants and all study procedures are detailed in reprinted journal articles in the appendices. Coliphages were studied to assess the feasibility of estimating animal virus levels which are below the limits of detection of present methodology. Relative concentrations of coliphages and animal viruses were analyzed. Appendix A, 'Airborne Coliphages from Wastewater Treatment Facilities' (K. F. Fannin, et al., Applied and Environmental Microbiology, Vol. 31, No. 5, May 1976, p 705-710), presents a detailed analysis of airborne coliphages that form plaques on E. coli hosts. Coliphages were enumerated using most probable number procedures. Field sampling procedures are described. Appendix B, 'Field Studies on Coliphages and Coliforms as Indicators of Airborne Animal Viral Contamination from Wastewater Treatment Facilities' (K. F. Fannin, et al., Water Research, Vol. 10, 1976, p 1-7), investigates the use of coliforms and coliphages as indicators of animal virus contamination in both trickling filter and an activated sludge treatment plant. Ratios of coliphages to animal viruses indicate that wastewater treatment plants may be a continuous source of low level concentrations of animal viruses. Coliphages are more effective indicators of airborne animal viral contamination than coliforms. (Seip-IPA)
W78-06806

THE APPLICABILITY OF PYROLYSIS-GAS-LIQUID CHROMATOGRAPHY FOR THE QUANTITATIVE IDENTIFICATION OF BACTERIA IN SEWAGE TREATMENT PLANT EFFLUENT,
Catholic Univ. of America, Washington, DC. Dept. of Civil Engineering.
R. A. Symuleski.
Available from University Microfilms International, Ann Arbor, Michigan 48106; Order No. 77-29184. PhD Thesis, 1977, 166 p.

Descriptors: *Pollutant identification, *Chromatography, *Bacteria, Analytical techniques, *Testing procedures, *Chemical analysis, Heterogenity, Homogeneity, Sewage effluent, Sewage treatment, Industrial wastes, Municipal wastes, Waste water treatment.

Pyrolysis-gas-liquid chromatography (PGLC) was evaluated for the identification of bacteria in aqueous sewage effluent. PGLC analysis of bacteria reduced the identification time from the 24-27 hrs necessary for other methods to 1-2 hrs. Analysis at the strain level resulted in unique signatures of bacterial cells using the PGLC technique which could be detected at bacteria levels of bout 80 colony-forming units in 100 ml of liquid. The chemical heterogeneity of the secondary treated waste analyzed resulted in more accurate qualitative results than quantitative. It was determined that PGLC analysis of homogeneous effluent would yield better quantitative results. Bacterial signatures calculated by PGLC were not dependent on the composition of the effluent. The method may also be applicable to the analysis of food, cosmetic, and pharmaceutical industry wastes. Signatures of bacteria detected in the effluent were matched with a data bank of species' signatures included in a computer program designed for the project. (Lisk-FIRL)
W78-06814

GAS-LIQUID-CELL OXYGEN ABSORPTION IN FERMENTATION,
Iowa State Univ., Ames. Engineering Research Inst.
G. T. Tsao, A. Mukerjee, and Y. Y. Lee.
(1974). 13 p, 16 fig, 10 ref. OWRT A-032-IA (11).

Descriptors: *Oxygen, *Absorption, *Aerobic bacteria, *Air-water interfaces, *Diffusion, Mass transfer, Dissolved oxygen, Fermentation, Waste water treatment, Oxygen transfer.

The effect of viable and aerobic microbial cells (present in solution) on oxygen absorption from gas into aqueous solutions was investigated. A theoretical explanation with simple diagrams, experimental results, and a model of gas-liquid-cell absorption is presented. Physical and chemical models are proposed and explicated for oxygen transfer at the liquid-gas interface; an equation for the rate of gas absorption is presented. The effect of sulfite ions present in solution on oxygen consumption is discussed. Since cells consume the oxygen molecules being absorbed at the gas-liquid interface, it is hypothesized that bacteria affect and enhance the oxygen absorption rate. The effect of viable microbial cells on the mass transfer coefficient was investigated by measuring the rate of oxygen absorption into liquids containing different cell concentrations; the effects of reduction and enhancement of dissolved gas concentrations in the liquid bulk and the liquid phase mass transfer coefficient were also studied. Experimental evidence suggests that the particle (or cells(concentration does affect and enhance the liquid film mass transfer coefficient. (See also W76-03321, W73-08120, W72-00085, and W71-08661). (Seip-IPA)
W78-06824

DETERMINATION OF AMMONIUM N AND NITRATE N IN ACID PERMANGANATE SOLUTION USED TO ABSORB AMMONIA, NITRIC OXIDE, AND NITROGEN DIOXIDE EVOLVED FROM SOILS,
Iowa State Univ., Ames. Dept. of Agronomy.
L. G. Bundy, and J. M. Bremner.
Comm. in Soil Science and Plant Analysis, Vol 4, No 3, p 179-184, 1973. 1 tab, 14 ref. OWRT A-041-IA(4).

Descriptors: *Ammonia, *Ammonium compounds, *Nitrates, *Soil analysis, Distillation, Analytical techniques, Nitrogen compounds, *Pollutant identification, *Nitric oxide, *Nitrogen dioxide, Steam distillation, *Acid permanganate, *Nitrogen-15 analysis.

Simple steam distillation methods are described for determination of ammonium N and nitrate N in an acid potassium permanganate solution (0.1M KMn04: 025M H2S04) used to absorb NH3, NO, and NO2 evolved from soils. The methods in volve the use of Mgo for distillation of ammonia and the use of FeS04, Ag2S04, and Mg0 for reduction of nitrate to ammonia. These procedures are rapid and precise, and permit nitrogen-15 analysis of NH3-N and (NO + NO2)-N evolved from soils. (Seip-IPA) (See also W76-03141 and W70-01075)
W78-06828

THE USE OF BIOLOGICAL INDICATOR ORGANISMS TO MONITOR TRACE METAL POLLUTION IN MARINE AND ESTUARINE ENVIRONMENTS--A REVIEW,
National Environment Protection Board of Sweden, Upsala. Dept. of Zoology.
D. J. H. Phillips.
Environmental Pollution, Vol 13, No 4, p 281-317, August 1977. 2 fig, 5 tab, 189 ref.

Descriptors: *Bioindicators, *Monitoring, *Water pollution sources, Metals, Ecosystems, Trace elements, Resources development, *Bibliographies, *Reviews, Outer Continental Shelf.

The use of biological indicator organisms to define areas of trace metal pollution appears most attractive, as these organisms not only concentrate metals from water, allowing inexpensive and relatively simple analysis, but they may also represent a moving time-averaged value for the relative biological availability of metals at each site studies. However, the use of indicator organisms introduces biological variables which are not present in physico-chemical studies of water or sediments. These variable merit consideration inas much as they may affect the resluts of indicator surveys for trace metals. In addition, different indicator organisms measure different portions of the total trace metal load on an ecosystem. The present state of knowledge on the use of indicator organisms to study trace metal pollution is reviewed, with particular reference to the use of macroalgae, bivalve molluscs and telosts. It is suggested that the macroalgae and bivalve molluscs are the most efficient and reliable indicators developed to the present time. It is further suggested that the effects of sampling and environmental variables have been largely overlooked, and that further study in the field and in the laboratory is necessary before the results of surveys using biological indicator organsims can be relied upon. (Sinha - OEIS)
W78-06832

RESISTANCE OF DETRITOPHAGES OF BIOFILTERS IN PHENOL POISONING (IN RUSSIAN),
Research Inst. of Chemical Technology and Polymer, Dzerzhinsk (USSR).
For primary bibliographic entry see Field 5C.
W78-06833

TOXICOLOGY OF POLYETHYLENEPOLYAMINE AND SUBSTANTIATION OF ITS MAXIMUM PERMISSIBLE CONCENTRATION IN BODIES OF WATER (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W78-06837

ON THE QUESTION OF O2 REQUIREMENT IN DETERMINING ACUTE TOXICITY IN FISH (IN GERMAN),
Bundesgesundheitsamt, Berlin (West Germany). Inst. fuer Wasser-, Boden- und Lufthygiene.
For primary bibliographic entry see Field 5C.
W78-06838

ISOLATION OF VIBRIO NAG IN WASTE WATER OF THE REGION OF RIJEKA IN 1973 AND 1974 (IN SERBO-CROATIAN),
Zovod. Zastitu Zdravlja, Riijeka, Yugosl. Zavod za Zastitu Zdravlja, Rijeka (Yugoslavia).
B. Coric, and V. Samanic.
Mikrobiologija (Belgr) 13(2), p 217-223, 1976.

Descriptors: *Isolation, Pollutant identification, *Bacteria, Bacteriology, Waste waters, Sampling, *Vibrios, *Cholera(Human), *Yugoslavia.

Bacteriological tests of waste water in 1973 and 1974 encompassing 476 samples from the Riijeka region of Yugoslavia indicated that 32 samples (6.7%) contained non-agglutinating (NAG) vibrios. The epidemiological and clinical implication of the NAG vibrios in human cholera are discussed.-Copyright 1978, Biological Abstracts, Inc.
W78-06839

THE LEVEL OF PESTICIDES IN RURAL WATER SOURCES (IN RUSSIAN),
Vsesoyuznyi Nauchno-Isseldovatelskii Inst. Gigieni i Toksikologii Pestitsidov, Kiev (USSR).
K. K. Vrochinskii, V. D. Chmil, V. I. Senchenko, V. F. Shevchenko, and A. I. Korop.
Gig Sanit (2), p 97-98, 1977.

Descriptors: *Gas-liquid chromatography, *Chromatography, *Pollutant identification, Water supply, Rural water sources, Pesticides, *BHC, *DDD, *DDE, *Hexachlorocyclohexane, *Pesticide residues, Organochlorine pesticides.

Gas-liquid chromotography and TLC analysis of water from above- and ynderground sources in rural agricultural areas of the USSR using organochlorine pesticides revealed traces of DDD, DDE and especially gamma hexachlorocyclohexane. The variety and quantity of pesticides were a function of the intensity of their use in a given region. The traces observed did not exceed maximum permissible levels, but their possible ingestion in the drinking water should be considered in evaluating the danger of their complex and combined action.--Copyright 1978, Biological Abstracts, Inc.
W78-06846

THE LEVELS OF METALS IN DOCK-YARD SEDIMENTS WITH PARTICULAR REFERENCE TO THE CONTRIBUTIONS FROM SHIP-BOTTOM PAINTS,
University of Manchester Inst. of Science and Technology (England). Pollution Research Unit. and Bolton Inst. of Tech. (England).
E. G. Billinger, and B. R. Benham.
Environmental Pollution, Vol 15, No 1, p 71-81, January 1978. 1 fig, 4 tab, 8 ref.

Descriptors: *Paints, *Metals, *Sediments, *Water pollution sources, Antifouling materials, Ships, *Pollutant identification, Outer Continental Shelf, Great Britain, Ship-bottom paint.

Levels of the metals copper, lead, tin and zinc have been detemined in a range of ship-bottom paints by atomic absorption spectrophotometry. Copper, lead and zinc have been similarly determined in concentrated nitric acid digests and 1M ammonium acetate extracts of sediments taken from enclosed dock-basins at Liverpool, Tilbury and Manchester. At each of the dock-yards concentrations of all the metals in nitric acid extracts were elevated in the vicinity of dry-docks. These elevations are believed to be due to the presence of residues from the ship-bottom paints. The amounts of copper and zinc, which are major components of antifoulant paints, in the ammonium acetate extracts correlate closely with the levels in the nitric acid digests lead, which is found mainly in anticorrosive and primer paints, does not. Direct toxic effects of the metals to marine organisms are considered, but are not thought to be important in view of the large dilution and dispersal capacities usually available. The possibility of or-

ganisms developing genetic resistance to heavy metals in enclosed dock-basins in discussed. It is noted that many of the dock-yard organisms are components of the ship-fouling ecosystem, so that the premature exposure to the toxins of antifoulant paints may result in the development of toxin resistance of considerable economic importance. (Sinha - OEIS)
W78-06848

COMBINED TOXICITY EFFECTS OF CHLORINE, AMMONIA, AND TEMPERATURE ON MARINE PLANKTON,
Woods Hole Oceanographic Inst., MA.
For primary bibliographic entry see Field 5C.
W78-06863

THE UTILITY OF SKYLAB PHOTO-INTERPRETED EARTH RESOURCES DATA IN STUDIES OF MARINE GEOLOGY AND COASTAL PROCESSES IN PUERTO RICO AND THE VIRGIN ISLANDS,
Geological Survey, San Juan, PR.
For primary bibliographic entry see Field 5B.
W78-06867

CONTRIBUTION TO THE PROBLEM OF FORECASTING THE MINERAL CONTENT AND CHEMICAL COMPOSITION OF RESERVOIR WATER,
Novocherkassk Inst. of Chemical Hydrology (USSR).
For primary bibliographic entry see Field 2H.
W78-06881

THE BEHAVIOUR OF DISSOLVED ALUMINUM IN ESTUARINE AND COASTAL WATERS,
University of East Anglia, Norwich (England). School of Environmental Science.
For primary bibliographic entry see Field 5B.
W78-06893

A FILTRATION UNIT FOR USE WITH CONTINUOUS AUTOANALYTICAL SYSTEMS APPLIED TO HIGHLY TURBID WATERS,
Institute for Marine Environmental Research, Plymouth (England).
A. W. Morris, R. J. M. Howland, and A. J. Bale.
Estuarine and Coastal Marine Science, Vol. 6, No. 2, p 105-109, February 1978. 2 fig, 1 tab, 4 ref.

Descriptors: *Filtration, *Chemical analysis, *Suspended solids, Filters, Turbidity, Equipment, Instrumentation, Nitrates, Nitrites, Chemicals, Sampling, Water quality, Estuaries, Pollutant identification.

A simple unit for filtration prior to continuous autoanalysis of highly turbid waters was described. Seawater can be supplied at a rate of 10 ml/min, after filtration through a 0.45 micrometer pore-sized membrane filter (47 mm diameter), for at least 45 min from seawater containing 1,000 parts per million of suspended solids. (Sims-ISWS)
W78-06894

THE SOURCES OF DISSOLVED MANGANESE TO CALICO CREEK, NORTH CAROLINA,
North Carolina Univ. at Chapel Hill. Curriculum in Marine Sciences.
For primary bibliographic entry see Field 5B.
W78-06895

DETERMINATION OF THE FLUORIDE ION IN THE PUBLIC HEALTH STUDY OF WATER (IN ITALIAN),
Siena Univ. (Italy). Inst. of Hygiene.
M. Zanda.
Riv Ital Ig 35(4-6), p 154-169, 1975.

Descriptors: *Pollutant identification, Fluoride ions, Public health, Dental caries, Fluorosis, Human diseases, Industrial wastes, Photometry, Waste water.

The determination of fluoride ion is an important public health function because excessive dumping of industrial fluorides into waste water which must ultimately be reprocessed for drinking purposes could give rise to fluorosis. At the same time insufficient fluoride in human nutrition is a major factor in dental caries in man. Modern methods for fluoride determination in drinking water are reviewed, with particular reference to photometric comparison methods. The Scott-Sanchis, Lamar, Taylor comparison and Bullock - Schouboe methods are summarized.--Copyright 1978, Biological Abstracts, Inc.
W78-06896

FLUORESCENCE DETERMINATION OF THE CONCENTRATION OF BACTERIA IN LIQUID MEDIA (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
L. F. Osipov, A. I. Sakevich, and L. V. Podgaevskaya.
Gidrobiol Zh 13(1), p 111-114, 1977.

Descriptors: *Bacteria, *Pollutant identification, *Algal culture, *Anabaena-variabilis, Chlorides, *Fluorescence, *Microcystis-aeruginosa, Nostocmuscorum, *Dyes.

A method for determining the concentration of bacteria in algal culture media containing over 1 million bacterial cells/ml is described. The method is based on changes in the fluorescence of a dye (pseudoisocyano-chloride) adsorbed onto the surface of bacterial cells. Tests on cultures of Microcystis aeruginosa, Nostoc muscorum and Anabaena variabilis indicated that within the limits of the studied concentrations (4.3-59.0 million bacterial/ml), results deviated by no more than + or - 9.8% from those of the direct count method.--Copyright 1978, Biological Abstracts, Inc.
W78-06898

DEVELOPMENT OF METHODS FOR RAPID DETECTION OF TRACE METALS IN SEA WATER,
Institut Rudjer Boskovic, Zagreb (Yugoslavia). Center for Marine Research.
M. Branica.
In: 'Proceedings of the International Symposium on Marine Pollution Research Held in Gulf Breeze, Florida on Jan 27-29, 1976,' Environmental Protection Agency, Office of Research and Development Report No EPA-600/9-76-032, January 1976. p 114-119, 1 tab, 16 ref.

Descriptors: *Pollutant identification, *Water pollution sources, *Heavy metals, Water pollution, *Trace elements, Sea water, Electrochemical methods, *Trace metals.

In unpolluted natural waters heavy metal ions are present in very low concentrations, about one microgram/liter. Higher concentrations, caused by waste disposal, sometimes surpass permissible toxic levels, causing serious changes in ecophysiological equilibria of organisms in natural aquatic systems (rivers, lakes and seas). Because of their selectiveness, simplicity and high sensitivity, electrochemical methods, especially polarography and related techniques, are promising for determination of trace metals in natural and polluted waters. Applications of advanced techniques of electrochemistry in aquatic chemistry are still in the beginning stage. However, these methods will eventually play an important, or perhaps the key, role in determination, speciation and characterization of metal traces and microconstituents of fresh and sea water. This should contribute greatly to elucidation of mechanisms and biogeochemical pathways of microconstituents (and pollutants) in the aquatic environment. Electrochemical methods are very convenient for determination of concentration of trace metal ions in sea water due to their high sensitivity, simplicity of procedure and relatively cheap instrumentation. The sensitivity limit of the particular method depends on the excitation and measuring technique and the type of working electrode used. In addition to quantitative aspects, it is also possible to characterize the physicochemical state of ionic species in natural and polluted sea water. (See also W78-06906) (Sinha-OEIS)
W78-06919

BIOASSAYS AS INDICATORS OF POLLUTION EFFECTS,
Environmental Research Lab., Gulf Breeze, FL.
D. L. Coppage.
In: 'Proceedings of the International Symposium on Marine Pollution Research Held in Gulf Breeze, Florida on Jan 27-29, 1976, 'Environmental Protection Agency, Office of Research and Development Report No EPA-600/9-76-032, January 1976. p 133-139, 1 fig, 22 ref.

Descriptors: *Water pollution effects, Water quality, *Bioassay, Aquatic life, Bioindicators, *Pollutant identification, Measured response.

The objective of marine bioassay usually is to determine a pollutant's (a) concentration harmful to organisms, (b) persistence and degradability, (c) rate of accumulation and loss in organisms consumed by other organisms, and (d) mode of action on organisms. These data are used to establish water quality standards. Although it is not practical to study all species that may be affected by a pollutant, a variety of marine or estuarine species may be tested to estimate which taxonomic groups are most sensitive. The bioassays used at the U.S. Environmental Protection Agency, Environmental Research Laboratory, Gulf Breeze, Florida, may be regarded as three interrelated types: macroscopic, microscopic, and metabolic. Some of the bioassays and results are reviewed as examples of their variety and applications. (See also W78-06906) (Sinha-OEIS)
W78-06921

GLOBAL MONITORING OF MARINE POLLUTANTS,
Scripps Institution of Oceanography, La Jolla, CA.
E. D. Goldberg.
In: 'Proceedings of the International Symposium on Marine Pollution Research Held in Gulf Breeze, Florida on Jan 27-29, 1976,' Environmental Protection Agency, Office of Research and Development Report No EPA-600/9-76-032, January 1976. p 162-165, 6 ref.

Descriptors: *Water pollution sources, *Water pollution effects, *Pollutant identification, *Environmental effects, *Monitoring, *Water quality control, Oil pollution, Food chains, Heavy metals, *Outer Continental Shelf, Petroleum development, Ocean dumping, Ocean outfalls, Human health, Petroleum hydrocarbons, Chlorinated hydrocarbons, Radionuclides.

There are several compelling reasons to initiate a continuing and systematic surveillance of already defined pollutants in coastal marine waters. First, the present exposure levels to marine organisms can be used in principle by ecologists to ascertain whether any organisms or communities of organisms are threatened. Second, environmental concentrations allow an assessment of dangers to public health through the consumption of seafoods. Third, present levels allow predictions of future levels. With knowledge of present and past environmental releases of the pollutant in question and with an estimate of future leakages based upon production and use, data models for pollutant dispersion about the environment can be formulated and future levels may be foretold.

Such information is vital to those responsible for management of marine resources. Where predicted levels are unacceptable on the basis of possible environmental impact, restrictions upon releases can then be imposed. There are four collectives of pollutants that may jeopardize continued use of marine resources: artificial radionuclides; petroleum hydrocarbons; chlorinated hydrocarbons; and heavy metals. (See also W78-06906) (Sinha-OEIS)
W78-06922

USE OF FERROUS HYDROXIDE FOR DETERMINATION OF NITRATE IN SOIL EXTRACTS,
Iowa State Univ., Ames. Dept. of Agronomy.
J. M. Bremner, and L. G. Bundy.
Journal Paper No J-7544 of the Iowa Agriculture and Home Economics Experiment Station, Ames, (Project No 1835), (1973). 7 p. OWRT A-041-IA(3).

Descriptors: *Nitrates, *Soil analysis, *Soil chemical properties, Distillation, Phosphate, Silicates, Analytical techniques, *Pollutant identification, *Soil extracts, *Steam distillation, Ferrous hydroxide.

A simple steam distillation method of determining nitrate that is not subject to interference by substantial amounts of phosphate or silicate is described. The method was developed for studies requiring determination of the sulfate and nitrate formed by incubation of soils and amended soils for various times; it gives quantitative recovery of nitrate N added to Ca(H2PO4)2 solution containing 500 ppm of P and to extracts obtained by treating soils with this reagent. The methodology is based on the fact that, when a nitrate solution is heated with appropriate amounts of FeSO4 and MgO, the ferrous hydroxide produced reduces the nitrate quantitatively to ammonia. The method is rapid and precise, and tests reported show that it is satisfactory for nitrate analysis of soil extracts. (See also W76-03141 and W70-01075) (Seip-IPA)
W78-06925

RELATION OF BULK PRECIPITATION AND EVAPOTRANSPIRATION TO WATER QUALITY AND WATER RESOURCES, ST. THOMAS, VIRGIN ISLANDS,
Geological Survey, Atlanta, GA. Water Resources Div.; and Geological Survey, Reston, VA. Water Resources Division.
For primary bibliographic entry see Field 2D.
W78-06934

THE KINETICS OF CALCITE DISSOLUTION IN C02-WATER SYSTEMS AT 5 DEG TO 60 DEG C AND 0.0 TO 1.0 ATM C02,
Geological Survey, Reston, VA. Water Resources Div.; and University of East Anglia, Norwich (England).
For primary bibliographic entry see Field 1B.
W78-06936

PROGRAM FOR EVALUATING STREAM QUALITY IN NORTH CAROLINA,
Geological Survey, Raleigh, NC. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-06939

GEOCHEMISTRY,
Geological Survey, Reston, VA. Geologic Div.; and Geological Survey, Reston, VA. Water Resource Div.
For primary bibliographic entry see Field 2K.
W78-06946

WATER-QUALITY INVESTIGATION OF THE TYRONZA RIVER WATERSHED, ARKANSAS,
Geological Survey, Little Rock, AR. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-06951

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1976--VOLUME 1. NORTHEAST FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06952

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1976--VOLUME 2. SOUTH FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06953

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1976--VOLUME 4. NORTHWEST FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06954

DRINKING WATER AND HUMAN HEALTH: PART II,
National Water Well Association, Worthington, OH.
T. E. Gass.
Water Well Journal, Vol 32, No 4, p 30-32, March, 1978.

Descriptors: *Potable water, *Pollutants, *Public health, Arsenic compounds, Selenium, Flouride, Nitrates, Sodium, Hardness(Water), Inorganic compounds.

Five chemical constituents of drinking water are discussed: (1) asenic--its toxicity is dependent upon its chemical form, and the type, rate, and duration of exposure. Arsines and trivalent inorganic asenic (arsenite) are the most toxic forms. IPDW regulations set a maximum level of 0.05 mg/l for water supplies. (2) selenium--an essential nutrient, though large or chronically high doses may produce toxicity effects. IPDW regulations call for 0.01 mg/l. (3) fluoride--concentrations of 1 mg/l are generally considered to have a beneficial effect. Tooth mottling and skeletal flourosis may occur at higher concentrations. Cancer and other severe health problems claimed to be linked to flouride in water have yet to receive conclusive scientific evidence for such relationships. (4) nitrate--although IPDW regulations list 10 mg/l as a limit, some studies show toxic effects in infants even at this level. (5) sodium--no maximum recommended limit, as food is by far the major contributor of sodium to the human diet. Brief mention is also made of the interrelationsip of water hardness and cardiovascular disease. (See also W78-05195) (Eberle-NWWA)
W78-06971

SATELLITE REMOTE SENSING STUDY OF THE TRANS-BOUNDARY MOVEMENT OF POLLUTANTS,
Environmental Research Inst. of Michigan, Ann Arbor.
C. T. Wezernak, and D. R. Lyzenga.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 069. Price codes: A03 in paper copy, A01 in microfiche. Report No EPA-600/3-77-056, May 1977. 17 p. 7 fig, 4 ref. R803671.

Descriptors: *Remote sensing, *Monitoring, Eutrophication, Lake Erie, Lake Huron, Suspension, Satellites(Artificial), Water resources, Water quality, Pollutant identification, Path of pollutants, *Detectors, Imagery, Earth Resources Technology Satellite(ERTS).

A limited analysis of ERTS (LANDSAT) data of the western basin of Lake Erie and the southern portion of Lake Huron was performed. The objective was to depict the large-scale movement of water masses, as manifested in terms of suspended solids, and to demonstrate the use of ERTS data in large lakes monitoring. ERTS (LANDSAT) data, as recorded on computer compatible tapes, were processed to display surface circulation features, surface suspended solids distribution, surface chlorophyll distribution, and secchi disc transparency. Results show that high concentrations of suspended solids are typical along the Canadian shore of Southern Lake Huron and throughout the western basin of Lake Erie. In the latter case, high suspended solids concentrations are largely due to loading from the Maumee River, the Detroit River, and resuspension of bottom sediments. Since the four ERTS (LANDSAT) bands offer a water quality potential essentially restricted to suspended solids, turbidity, transparency, and the detection of phytoplankton blooms, it is considered that attempts to correlate LANDSAT data with other substances in aqueous solution or suspension would be difficult to justify. In conclusion, results demonstrate the potential of satellite remote sensing for monitoring of large water bodies, especially in conjunction with ground truth measurements for calibration purposes. (Wares-IPA)
W78-06979

PETROLEUM HYDROCARBONS IN THE NORTHERN PUGET SOUND AREA--A PILOT DESIGN STUDY,
NOAA National Analytical Facility, Seattle, WA.
For primary bibliographic entry see Field 5C.
W78-06981

COMPARISON OF TWO METHODS USED BY DIVERS FOR SAMPLING BENTHIC INVERTEBRATES IN DEEP RIVERS,
Maine Univ. at Orono. Dept. of Entomology.
For primary bibliographic entry see Field 7B.
W78-07025

MICROELEMENTS OF IRON AND COPPER IN LIVER AND MUSCLES OF RAINBOW TROUT (SALMO GAIRDNERI RICHARDSON) FROM DIFFERENT HATCHERIES,
Sarajevo Univ. (Yugoslavia). Bioloski Inst.
N. Guzina, and M. Aganovic.
Ichthyologia, Vol 9, No 1, p 75-84, 1977. 4 fig, 1 tab, 11 ref.

Descriptors: *Iron, *Copper, *Rainbow trout, *Spectrophotometry, *Fish hatcheries, *Fish physiology, *Animal metabolism, Salmonids, Analytical techniques, Chemical analysis, Pollutant identification, Liver, Muscle, Tissue analysis.

The analysis of microelements of iron and copper in liver and muscles of rainbow trout was performed by the method of spectrophotometry in several different hatcheries. Values of iron and copper in liver and muscle tissue varied significantly, depending on the hatchery source. (Deal-EIS)
W78-07026

INFILTRATION-INFLOW SEWER LINE ANALYZER,
P. D. Petroff.
United States Patent 4,070,563. Issued January 24, 1978. Official Gazette of the United States Patent Office, Vol. 966, No. 4, p 1566-1567, January, 1978. 1 fig.

Descriptors: *Pipes, *Computers, *Instrumentation, *Measurement, *Patents, Pressure measuring instruments, Pipelines, Sewerage, Equipment, Design criteria, Waste water treatment, Municipal wastes.

A patented infiltration-inflow sewer line analyzer with computer monitoring is described. Adjustable liquid pressure sensors are mounted at both ends of the sewer pipe. The sensors periodically monitor the sample liquid pressure between the sensors within the pipe and record the values. The recorded pressure values over a selected period of time are converted into liquid flow rates and fed to a computer. The computer is programmed with dry weather and rain flows within the pipe section as supplied by the monitors. Dry and wet weather flow rates monitored at one end of the pipe are compared by the computer with the same time measurements at the other end of the sewer pipe. Rainfall inflow and infiltration rates in the pipe are measured and compared by the computer with previously collected rainfall and dry weather values. (Lisk-FIRL)
W78-07076

ATMOSPHERIC DISPERSION CHARACTERISTICS IN COASTAL ENVIRONMENTS,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
S. A. Hsu.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 505, Price codes: A02 in paper copy, A01 in microfiche. Technical Report No. 224, Reprint from Preprints, The 3rd International Ocean Development Conference, August 5-8, 1975, Tokyo, Japan, Vol. 5, p 63-75. 11 fig, 26 ref.

Descriptors: *Coastal structures, *Air pollution, *Power plants, Coastal plains, Air environment, Effluents, Path of pollutants, Radioactive wastes, Smoke, Nuclear powerplants.

Proposed construction of offshore facilities such as nuclear-power plants, airports, and other structures which are potential emitters of pollutants necessitate consideration of atmospheric diffusion and analysis of the feasibility of such structures from the meteorological point of view. The potentially harmful nature of the radioactive materials involved dictates that even small quantities be treated with respect. Special attention must be given to design criteria in locations where hurricanes, storm surges, tsunamis, waterspouts, or other catastrophic meteorological or oceanographic phenomena may occur. Major locational criteria are: (1) Offshore winds should be prevalent during most of the year, particularly during the summer; (2) the upwind coastal region should be relatively flat in order to avoid a mesoscale turbulent vortex; and (3) offshore bottom slope should be gentle and bathymetrically uniform to attenuate storm surges and minimize wave effects. (Steiner-Mass)
W78-07083

MEASUREMENT OF 239 - 240 PU IN THE NORTHWESTERN MEDITERRANEAN,
International Lab. of Marine Radioactivity.
For primary bibliographic entry see Field 2L.
W78-07099

MOLECULAR SPECTRAL INTERFERENCE IN THE DETERMINATION OF ARSENIC BY FURNACE ATOMIC ABSORPTION,
Environmental Research Lab., Duluth, MN.
J. E. Poldoski.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 929, Price codes: A02 in paper copy, A01 in microfiche. Reprint from: Report No. EPA-600/J-77-035, 1977. Atomic Absorption Newsletter, Vol. 16, No. 3, p 70-73, May-June 1977. 4 tab, 9 ref.

Descriptors: *Arsenic compounds, *Water analysis, *Analytical techniques, Silicates, *Pollutant identification, *Atomic absorption, *Spectral interference, Hydrofluoric acid, Arsenic analysis.

Serious molecular spectral interferences, which occur in furnace atomic absorption determinations of arsenic in natural water samples containing relatively low arsenic concentrations and high concentrations of suspended silicate minerals, are reported. In some water samples, arsenic concentrations were erroneously high, by more than a factor of five above the actual concentration. (Results of analyses were confirmed by an alternative analytical method.) The addition of hydrofluoric acid to the sample and the use of a narrow bandpass will help control and identify this problem. Use of the less sensitive 197.2 nm analytical wavelength is an additional alternative method; however, more research is needed to determine the degree and manner of interference by other substances. (Seip-IPA)
W78-07118

REVIEW OF ENVIRONMENTAL ISSUES OF TRANSPORTATION OF ALASKAN NORTH SLOPE CRUDE OIL,
MITRE Corp., McLean, VA. METREK Div.
For primary bibliographic entry see Field 6G.
W78-07121

1977 INTENSIVE WATER QUALITY SAMPLING PROGRAMS IN NORTH CENTRAL TEXAS.
North Central Texas Council of Governments, Arlington.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 915, Price codes: A02 in paper copy, A01 in microfiche. March 1977. 15 p, 5 fig, 1 tab. P-006038-01-0.

Descriptors: *Sampling, *Water analysis, *Water quality, *Monitoring, *Texas, Land use, Floods, Runoff, Storms, Planning, Sediments, Storm runoff.

Each of the intensive water quality sampling programs being conducted by the North Central Texas Council of Governments and participating local agencies is summarized; program objectives and methodologies are outlined. Programs include: an in-depth field study of the impact of land use on water quality in Lake Ray Hubbard; Trinity River continuous automated monitors and water treatment plant sampling during storm events; river bottom sediment analysis; several urban/nonurban runoff sampling activities; and areawide urban stormwater sampling efforts. The sampling programs are designed to address specific data needs of the areawide planning process and to utilize existing intensive and routine monitoring programs to the maximum extent possible. (Seip-IPA)
W78-07127

QUALITY ASSURANCE PRACTICES AND PROCEDURES,
Environmental Protection Agency, Chicago, IL. Central Regional Lab.
B. Fairless.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 895, Price codes: A13 in paper copy, A01 in microfiche. Report No. EPA -905/4-77-004, April, 1977. 293 p, 2 append.

Descriptors: *Quality control, *Analytical techniques, *Water analysis, *Quality assurance, Accuracy, Precision, Environmental analysis.

The Quality Assurance Program used by the Central Regional Laboratory (CRL) is described; these practices provide means of measuring the accuracy and precision of all reported data and of communicating to data users and other offices the quality of any given set of data values. The program includes administrative responsibilities, methods of analyses, critical measurement audits for each method, and control limits for each audit. Reference is made to approximately 200 analytical procedures, used to analyze air, water, sediment, and biological samples for over 100 parameters. (Seip-IPA)
W78-07129

MONITORING TO DETECT PREVIOUSLY UNRECOGNIZED POLLUTANTS IN SURFACE WATERS, (TEXT AND APPENDIX: ORGANIC ANALYSIS DATA),
Illinois Univ. at Urbana-Champaign. Inst. for Environmental Studies.
B. B. Ewing, E. S. K. Chian, J. C. Cook, C. A. Evans, and P. K. Hopke.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 350, Price codes: A14 in paper copy, A01 in microfiche. Report No. EPA-560/6-77-015, July 1977. 75 p, 24 fig, 17 tab, 6 ref. Appendix: Report No. EPA-560/6-77-015A, July 1977. 299 p, 619 tab. EPA 68-01-3234.

Descriptors: *Industrial wastes, *Water quality, *Water pollution, *Water chemistry, *Surface waters, *Pollutant identification, Inorganic compounds, Organic compounds, Analytical techniques, *Industrial pollution.

Samples of surface waters were collected from 204 sites located near heavily industrialized areas across the United States. The samples were analyzed for all contaminants present at concentrations greater than 1 ppb. Each water sample was preconcentrated for analysis of organics in three fractions: volatile organics by nitrogen-gas stripping and the less-volatile organics by extraction with chloroform under both basic and acidic conditions. Organic constituents were identified by gas chromatography/mass spectrometry and quantified by gas-chromatographic techniques. Inorganic constituents were determined by spark-source mass spectrometry, energy-dispersive X-ray fluorescence analysis, and instrumental neutron activation analysis. For comparison with previous data from the same sites, the samples were also analyzed for total chemical oxygen demand, turbidity, conductivity, pH, color, oxidation-reduction potential, suspended solids, and volatile suspended solids. Results of the inorganic analyses were presented in previous quarterly reports. Final results of the organic analyses are presented in the appendix (separate volume). (Seip-IPA)
W78-07130

ENVIRONMENTAL MONITORING NEAR INDUSTRIAL SITES: SAMPLING AND ANALYSIS OF SELECTED TOXIC SUBSTANCES. TASK I - VINYLIDENE CHLORIDE,
Midwest Research Inst., Kansas City, MO.
J. E. Going, and J. L. Spigarelli.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 358, Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA-560/6-77-026, October, 1977. 137 p, 44 fig, 60 tab, 4 ref. 68-01-4115.

Descriptors: *Industrial wastes, *Potable water, *Polymers, *Water pollution, *Air pollution, Gas chromatography, Mass spectrometry, Wind, Toxins, Waste water(Pollution), Measurement, Testing, *Pollutant identification, *Vinylidene chloride, Product contamination, Wind dispersion.

A sampling and analysis program was conducted to determine the levels of vinylidene chloride (VDC) in air and water around 6 industrial sites, in drinking water from 4 major U.S. cities, and in several types of solid final products made from VDC polymers or co-polymers. Air was collected at perimeters of the industrial sites as 24-hr composite samples using charcoal adsorption tubes. Grab water samples were collected up- and downstream, at the plant discharge and at the municipal water treatment plants. In general, VDC in air was found only at monomer and polymer production facilities. The highest level detected, 51.8 micrograms/cu m (0.014 ppm) was found

down wind of a monomer production plant at the property line. At sites where VDC was found, its distribution correlated with the wind behavior that existed during the sampling period. The highest level of VDC in water (550 ppb) was found in an industrial wastewater canal. Generally, the level was less than 1 ppb and was detectable by gas chromatography/mass spectrometry (GC/MS) only. VDC was detected only in Miami, Florida drinking water at levels of 0.045-0.059 micrograms/l. VDC was found in two samples of Saran Wrap ant 4.9 and 58 ppm. No VDC was detected in PVDC monofilaments, modacrylic fibers or meat packaging film. The air and water samples were analyzed by gas chromatography and results confirmed by GC/MS; identities of other compounds in the samples were also established. (Seip-IPA)
W78-07132

ALTERNATIVE METHODS OF IDENTIFYING ORGANICS IN WATER,
Environmental Research Lab., Athens, GA.
W. T. Donaldson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 255, Price codes: A02 in paper copy, A01 in microfiche. Report No. NIH/NIEH'S-77/028, December 1976. 6 p, 4 ref. 1-R13-ES-01470-01.

Descriptors: *Potable water, *Organic wastes, *Monitoring, *Water quality standards, Water quality, Water pollution, *Pollutant identification, Analytical techniques, *Organic chemicals, *Carcinogens.

Requirements for an effective system of monitoring organics in water are described. The system must be capable of comprehensive analysis for specific organic chemicals. It must be amenable to easy addition of new parameters for analysis; it must detect chemicals at concentrations as low as 1 microgram/1 and possibly lower. Water supplies need not be sampled frequently, although composite samples may be necessary. Reliable analysts must be available, and adequate analytical quality control procedures must be implemented. A composite list of hazardous chemicals in drinking water has not yet been developed, but known adverse health effects and potential for getting into water supplies will probably be among the criteria that influence selection of compounds for which maximum concentration levels are set. If specific chemicals must be considered, standards will probably be set for a large number of them eventually; therefore, monitoring techniques will need to be applicable to a wide range of compounds. The concentration that must be detected is one of the most speculative areas of concern, knowledge is limited concerning the levels of chemicals that may cause cancer, birth defects, or mutations. (Seip-IPA)
W78-07133

ENVIRONMENTAL CHEMICALS: HUMAN AND ANIMAL HEALTH, AUGUST 7-11, 1972, FORT COLLINS, COLORADO.
Colorado State Univ., Fort Collins. Inst. of Rural Environmental Health.
For primary bibliographic entry see Field 5B.
W78-07134

MERCURY AS AN ENVIRONMENTAL POLLUTANT,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W78-07136

POLYCHLORINATED BIPHENYLS: AN INDUSTRIAL POLLUTANT,
Colorado State Univ., Fort Collins. Dept. of Entomology.
For primary bibliographic entry see Field 5B.
W78-07141

ECOLOGICAL CARRYING CAPACITY RESEARCH: YOSEMITE NATIONAL PARK. PART IV. SEASONAL AND GEOGRAPHICAL DISTRIBUTION OF INDICATOR BACTERIA IN SUBALPINE AND ALPINE WATERS,
California Univ., Berkeley. Dept. of Plant Pathology.
For primary bibliographic entry see Field 5B.
W78-07142

SUBSURFACE WASTE DISPOSAL IN LAMBTON COUNTY, ONTARIO - PIEZOMETRIC HEAD IN THE DISPOSAL FORMATION AND GROUNDWATER CHEMISTRY OF THE SHALLOW AQUIFER,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 5E.
W78-07166

WATER QUALITY INTERPRETIVE REPORT, PRINCE EDWARD ISLAND, 1961 - 1973,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
R. N. McNeely, and V. P. Neimanis.
Water Quality Interpretive Report No. 1, 1978, 139 p, 17 fig, 94 tab, 32 ref, 4 append.

Descriptors: *Water quality, *Streams, *Groundwater, Surface waters, Saline water, Freshwater, Domestic water, Industrial water, Estuaries, Discharge measurement, Nutrients, Wastes, Agriculture, Electric power production, Aquatic life, Recreation, *Canada, *Prince Edward Island, *Mill River, *Brudenell River, *Ion chemistry.

The Water Quality Branch, Fisheries and Environment Canada, is endeavouring to involve a wider audience in an appreciation of water quality information by publishing a new report series: Water Quality Interpretive Reports. Report No. 1 deals with the historical water quality data available from NAQUADAT for Prince Edward Island. Approximately 1600 samples, relating to 4 stream stations, 32 groundwater, and 60 estuary sites, were collected by federal and provincial agencies during the 12-year period 1961 to 1973 and analyzed for as many as 50 parameters. The major ion chemistry of Prince Edward Island surface and groundwaters was well defined. The dissolved major ions for surface waters could satisfactorily be estimated for discharge measurements by using site-specific, empirically derived equations, whereas the constituents of environmental concern, such as nutrients and contaminants, could not be adequately assessed by a monthly sampling program. A decline in surface water pH was observed over the 8-year period 1966 to 1973 at the Mill River site. Since there was an inverse relationship between stream pH and discharge at the site, the decreasing pH may have resulted solely from an increase in surface runoff, although the possible enhancement of the pH change by the deposition of acid aerosols into an environmentally sensitive area should be considered in future monitoring programs. (WATDOC)
W78-07176

CHEMICAL COMPOSITION OF RAIN AND BROOK WATER IN BRITTANY (FRANCE), (IN FRENCH),
Rennes Univ. (France). Hydrobiological Lab.
For primary bibliographic entry see Field 2K.
W78-07192

VIRUS DETECTION SYSTEM.
NASA Tech Briefs, Vol. 2, No. 2, p 239-240, Summer, 1977. 2 fig.

Descriptors: *Viruses, *Water reuse, *Disinfection, *Analytical techniques, *Monitoring, Microorganisms, Automation, Electronic equipment, Adsorption, Waste water treatment.

A nonpathogenic marker virus, bacteriophage F2, is used as a tracer in a water reclamation system to determine if other, possibly more toxic, viruses have survived the treatment process. The virus is first concentrated by adsorption onto cellulose acetate filters in the presence of trivalent cations (AlCl3) at low pH. A passive immune agglutination test, in which an antibody or an antigen is bound to latex beads, is used to detect the marker virus. The waste water detection system includes a reagent pump and metering system, reagent storage containers, a filter concentrator, an incubation/detection system, and an electronic readout and control system. Peristaltic pumping is used to control the flow sequence of the reagents and samples, and transmitted-light photometer is used to measure the degree of agglutination. (Schulz-FIRL)
W78-07200

5B. Sources Of Pollution

GEOHYDROLOGICAL ENVIRONMENTAL EFFECTS OF GEOTHERMAL POWER PRODUCTION - PHASE IIA,
Systems, Science and Software, La Jolla, CA.
J. W. Pritchett, S. K. Garg, D. H. Brownell, Jr, L. F. Rice, and M. H. Rice.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 687, Price codes: A09 in paper copy, A01 in microfiche. Final Report No. SSS-R-77-2998, September, 1976. 176 p, 66 fig, 17 tab, 40 ref, 1 append. AER 75-14492.

Descriptors: *Geothermal studies, *Reservoirs, *Computer programs, *Computer models, *Model studies, *Simulation analysis, Engineering, Environmental effects, Finite element analysis, *Geothermal power, Reservoir engineering, *Geothermal reservoirs, Multiphase flow, QUAGMR, Wairakei geothermal system.

Second-year results of a 3-year research effort are presented. The project involved development and validation of a computational capability whereby field information for a given geothermal reservoir system can be used to predict the behavior of the reservoir and associated subsurface environmental effects resulting from production and reinjection of geothermal fluids. The computer programs can be applied to predict the consequences of alternate production/injection strategies and to evaluate 3 potential environmental hazards: land surface subsidence, induced seismicity, and groundwater pollution resulting from reinjection of spent geothermal brines. The programs are time dependent, 3-dimensional, and treat the transport of mass and energy by single or 2-phase geothermal fluids being driven through a hetergeneous reservoir: thermal and mechanical interactions are treated in the models. Separate codes were developed in Phase I for describing the multiphase multidimensional unsteady flow of stream and water in a heterogeneous geologic setting without rock deformation, and for calculating the response of a multidimensional rock matrix to prescribed pore pressure changes with consideration of fluid flow; these codes have been coupled to produce a fully active geothermal reservoir simulator for simultaneous treatment of fluid flow and ground movement effects. Calculations are presented for a 5-spot production/injection pattern which show the numerical techniques employed to eliminate grid orientation problems. Reservoir calculations simulating pressure drawdown and buildup well tests are presented. Application of the reservoir simulator to a 2-dimensional vertical model of the Wairakei geothermal system has successfully reproduced the fluid production history over 1953 to 1967. (Seip-IPA)
W78-06701

THE ENVIRONMENT OF AMCHITKA ISLAND, ALASKA.
Department of Energy, Washington, DC. Div. of Military Application.
For primary bibliographic entry see Field 6G.
W78-06702

CONTENT OF SOME HEAVY METALS IN THE NATURAL WATERS OF THE SOUTHERN PART OF EASTERN TRANSBAYKALIA,
Irkutsk Gosudarstvennyi Univ. (USSR).
G. M. Shpeyzer, G. R. Filippova, N. A. Vlasov, N. N. Goncharova, and N. F. Aprelkova.
Soviet Hydrology, Selected Papers, Vol 15, No 2, p 145-147, 1976. 1 tab, 7 ref. Translated from Gidrokhimicheskiye Materialy, Vol 62, p 43-48, 1975.

Descriptors: *Heavy metals, *Groundwater, *Surface waters, *Surveys, Sampling, Chemical analysis, Copper, Nickel, Zinc, Manganese, Geochemistry, Water chemistry, Rivers, Streams, Water quality, Pollutants, Water pollution, *Path of pollutants, Distribution, *USSR.

The distribution of trace elements in the biosphere, particularly in natural waters, is of interest to medical geography and of importance for determining the ways and mechanism of migration of trace elements in the crust of the earth. The results of a study of this distribution can be used as a hydrochemical criterion in geological exploration. The content of some trace elements in ground and river waters in the sourhtern part of Eastern Transbaykalia was investigated. The study area embraces the low-hill part of Eastern Transbaykalia, the central part of the Onon-Borzya and the Daur steppes, and the basins of the Ingoda, Brozya, Onona, and Urunguy rivers and their tributaries. The mountain ranges have predominantly a northeast trend and are separated by broad dry depressions or depressions with mineral lakes. The study area includes the Khapcheranga-Lyubavin tin ore deposit, and the Klicha and Akatuyev complex ore deposits. A hydrochemical survey of the area was performed in different years and at different times in the course of three years. The results of copper, cobalt, nickel, zinc, and manganese determinations were presented, including the limiting values of the content of these elements and the average values from all the determinations for ground and river wastes separately. The total number of groundwater samples investigated was 120 and of river waters (including brooks) 30. The occurrence (number of samples in which a given element was found, computed in per cent of the total number of samples analyzed) of copper, nickel, cobalt, zinc, and manganese in the ground waters of the region was 94, 93, 92, 95, and 99%, respectively, and in river waters it was 94, 94, 93, 96, and 98%, i.e., these elements are fairly common. Their content varies within a broad range, especially that of manganese. (Sims-ISWS)
W78-06712

URANIUM IN RIVER RUNOFF,
Akademiya Nauk SSSR, Moscow. Inst. Okeanologii.
G. N. Baturin.
Soviet Hydrology, Selected Papers, Vol 15, No 2, p 148-151, 1976. 1 fig, 1 tab, 30 ref. Translated from Gidrokhimicheskiye Materialy, Vol 62, p 49-54, 1975.

Descriptors: *Rivers, *Mississippi River, *Dissolved solids, *Suspended solids, Runoff, Discharge(Water), Geology, Mineral water, Topography, Climates, Foreign countries, Foreign research, Measurement, Data processing, Reviews, *Uranium, *USSR, *Amazon River, Minerals.

River runoff is the main supplier of dissolved and suspended material to seas and oceans. Therefore, it is urgent to estimate the average content and total amount of chemical elements in river runoff. For example, the natural content of dissolved uranium in rivers varies within extremely broad limits, from 0.01 to 20-30 microgram/liter. It is not surprising, therefore, that the average contents of dissolved uranium in river waters, given by different researchers, differ by a factor of several tens, from 0.03 to 1 microgram/liter. This problem was examined for 32 rivers in the USSR, as well as for the Amazon and Mississippi rivers for which the necessary runoff data are available. The conclusions from this investigation were: (1) The natural content of dissolved uranium in river waters is related directly to the mineral content of these waters and inversely related to the water runoff rate. The average content of uranium in the rivers of the USSR is 0.9 microgram/liter and together with the Amazon and Mississippi it is 0.47 microgram/liter. (2) The content of suspended uranium in river waters is associated directly with the suspended particles concentration of these waters and the runoff rate of suspended substances. The average uranium content in the suspensions of rivers in the USSR is 0.00012%, and together with the Amazon and Mississippi it is 0.00019%. The average content of suspended uranium in river waters is about 0.5 microgram/liter. (3) The average uranium content in the total amount of dissolved and suspended substances of river runoff is 0.00027-0.00032%, i.e., approaches the average content of uranium in the earth's crust. (Sims-ISWS)
W78-06713

WEST ANTARCTIC ICE SHEET AND CO2 GREENHOUSE EFFECT: A THREAT OF DISASTER,
Ohio State Univ. Research Foundation, Columbus. Inst. of Polar Studies.
J. H. Mercer.
Nature, Vol 271, No 5643, p 321-325, January 26, 1978. 3 fig, 55 ref.

Descriptors: *Carbon dioxide, *Heating, *Glaciers, *Antarctic, *Melting, Ice, Melting, Water levels, Disasters, Model studies, Mathematical models, Atmosphere, Clouds, Ice cover, Heat, Heat transfer, Temperature, Latitudinal studies, Radiation, Solar radiation, Climatology, Greenhouse effect.

If the rate of global consumption of fossil fuels continues to grow at its present rate, atmospheric CO2 content will double in about 50 years. Climatic models suggest that the resultant greenhouse-warming effect will be greatly magnified in high latitudes. The computer temperature rise at lat 80 deg S could start rapid deglaciation of West Antarctica, leading to a 5 m rise in sea level. (Sims-ISWS)
W78-06721

REANALYSIS OF THE GREAT LAKES DROGUE STUDIES DATA,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 2H.
W78-06723

HIGHWAY OPERATION AND PLANT DAMAGE,
California State Dept. of Transportation, Sacramento. Transportation Lab.
D. I. Nakao, M. M. Hatano, R. B. Howell, and E. C. Shirley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 612, Price codes: A04 in paper copy, A01 in microfiche. Interim Report CA-DOT-TL-7134-1-76-13, January 1976. 70 p, 53 fig, 4 tab, 19 ref, 1 append. FHWA No F-5-14.

Descriptors: *Salts, *Highways, *Plant pathology, *California, Salt tolerance, Soils, Soil chemistry, On-site investigations, On-site data collections, Vegetation, Runoff, Deicers, Surveys, Transportation, Pollutants, Air pollution, Water pollution, Path of pollutants, Water pollution sources, Deicing salts, Plant damage, Salt concentrations.

A five-year study was undertaken by Caltrans in 1973 to study the effects of deicing salts on terrestrial vegetation and to explore other possible causes of plant damage, both natural and manmade, and to recommend alternative courses of action. The study is divided into two phases: (1) soil chemistry and salt analysis, and (2) vegetation damage assessment and recommendations for mitigation. The Environmental Branch of the Transportation Laboratory is performing phase 1, and the University of California at Davis has contracted to perform that portion of the research dealing with vegetation (phase 2). An interim report was prepared on the first phase of the study for the period of April 1973 - June 1975. Fifteen study sites, in and around the Tahoe Basin, were selected for in-depth study. A total of 2,459 soil samples were analyzed. Generally, salt concentrations in the soil are highest next to the roadway, decreasing with increased distance from the roadway. Concentrations are higher in drainage paths running through the downhill section of a study site. Salt application rates were recorded for possible correlation with soil analysis, topography, and plant damage. Ozone concentration data monitored from August 1974 through July 1975 indicated that the levels are below the Environmental Protection Agency air quality standard of 0.08 PPM (hourly average). (Sims-ISWS)
W78-06725

INFLUENCE OF TIDAL INLETS ON SALINITY IN ESTUARIES,
Indian Inst. of Tech., Madras. Hydraulic Engineering Lab.
N. J. Shankar.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol 101, No WW4, Proceedings Paper 11692, p 369-383, November 1975. 8 fig, 21 ref, 2 append. OWRT C-1158(1591)(5), (68-69)-167, (68-69)-343.

Descriptors: *Mathematical models, *Salinity, *Estuaries, *Inlets(Waterways), *Inflow, *Dispersion, *Texas, Model studies, Saline water, Estuarine environment, Aquatic habitats, Intertidal areas, Saline water-fresh water interfaces, Tidal effects, Mixing, Water circulation, Bays, Hydrodynamics, Numerical analysis, Tidal waters, *Hydrodynamic models, *Salinity transport models, *Gulf coast, *Matagorda Bay(Tex), *Galveston Bay(Tex).

The paper outlined mathematical hydrodynamic and salinity transport models applicable to the analysis of the effects of tidal inlets on shallow irregularly shaped estuaries typical of the Gulf Coast of the United States of America. The practical utility of these models has been developed and demonstrated for the simulation of salinity distributions under well-mixed water conditions for two estuaries on the Gulf Coast. Specifically, Matagorda Bay, Texas, was used to verify the salinity distribution model. Comparison between the computed concentrations and ground truth data was found to be excellent. Galveston Bay, Texas, was used to demonstrate the effects of a tidal inlet on salinity distribution. Comparison with the existing data indicated good qualitative agreement. The effects of tidal inlet were found to be mainly localized for the case considered. (See W75-07030 and W71-01798) (Bender - ISWS)
W78-06733

SOIL TEMPERATURE INCREASES INDUCED BY SUBSURFACE LINE HEAT SOURCES,
Long Island Vegetable Research Farm, Riverhead, NY.
K. A. Rykbost, L. Boersma, and G. D. Jarman.
Agronomy Journal, Vol. 68, No. 1, p 94-99, January-February 1976. 2 fig, 5 tab, 14 ref. OWRT B-039-ORE(6).

Descriptors: Temperature, *Soil temperature, Heat, *Heat transfer, Economics, Energy, Energy conversion, Soil physical properties, *Soil warming.

Generating electricity using the steam cycle produces large quantities of waste heat. Conversion efficiencies range from 32 to 38% which means that for three units of energy input about one unit of electrical energy is produced and two units of waste heat must be disposed of. Circulating the condenser cooling water through a network of underground pipes would result in warming the soil. The present study was initiated to evaluate the effect of increased soil temperatures on crop growth, the energy balance of the proposed system, and the economic feasibility of the system. This report presents results of the energy balance studies. (Skogerboe-Colorado State)
W78-06748

COMBINED EFFECT OF THERMAL AND ORGANIC POLLUTION ON OXYGEN SAG CURVE - PHASE II,
Worcester Polytechnic Inst., MA.
For primary bibliographic entry see Field 5C.
W78-06751

LEACHATE DAMAGE ASSESSMENT: CASE STUDY OF THE SAYVILLE SOLID WASTE DISPOSAL SITE IN ISLIP (LONG ISLAND), NEW YORK,
Environmental Protection Agency, Washington, DC. Office of Solid Waste Management Programs.
K. A. Shuster.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 080, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA/530/SW-509, June, 1976. 18 p, 7 fig, 5 tab, append.

Descriptors: *Leachate, *Solid wastes, *Waste dumps, *Ultimate disposal, *Incineration, *Cost analysis, New York, Water pollution sources, *Incineration wastes, *Well contamination, *Land disposal, *Islip(NY), Domestic wells.

The history and type of operation, damages caused by leachate, remedial actions, and associated costs are described for the Sayville solid waste disposal site in Islip, New York. The landfill, initially an open dump receiving all kinds of wastes, was started in a sand and gravel pit in 1933. The disposal site extends from about 20 ft above grade to the water table about 30 ft below grade, and covers approximately 17 acres. Incinerators were built on this site in 1939 and 1968; the former is currently used as a recycling center. The site receives mostly incinerator residue and some individually hauled residential wastes. The leachate plume extends more than 5,000 ft downgradient of the site, 170 ft in depth and up to 1,300 ft in width. About 0.22 sq mi and one billion gal of ground water have been contaminated. From 1968 to 1971, 3 residential wells were placed in the leachate plume near the disposal site because the well developer and homeowners were unaware of the contaminated ground water. All 3 wells were abandoned in 1974 when a public supply line was hooked up to the homes. During the 4 years between well contamination and public hookup, bottled water was used for drinking and filters were placed on the wells so they could be used for laundry and other nonconsumptive uses. Corrective actions were not attempted by th town of Islip. The total direct cost to the residences was about $6,884 ($2,295 per home); however, values of the damaged wells, public water consumption charges cost of bottled water, and other associated costs are not included. (Seip-IPA)
W78-06752

METHYLMERCURY: FORMATION IN PLANT TISSUES,
Environmental Protection Agency, Las Vegas, NV. Office of Research and Development.
For primary bibliographic entry see Field 5A.
W78-06753

LEACHATE DAMAGE ASSESSMENT: CASE STUDY OF THE FOX VALLEY SOLID WASTE DISPOSAL SITE IN AURORA, ILLINOIS,
Environmental Protection Agency, Washington, DC.
K. A. Shuster.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 068, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA/530/SW-514, June, 1976. 34 p, 7 fig, 7 tab, 4 ref, 1 append.

Descriptors: *Landfills, *Leachate, *Runoff, *Legal review, *Water quality control, *Illinois, *Cost analysis, Potable water, Pollutant identification, Water pollution sources, *Well contamination, *Groundwater contamination, *Sanitary landfill leachate, Aurora(IL), Fox Valley Disposal Company, Domestic wells, Leachate damage assessment project.

A case study of leachate damages at the Fox Valley solid waste disposal site, Aurora, Illinois, is presented. From 1961, the site was a non-polluting open dump; however, in 1965 Aurora contracted with the Fox Valley Disposal Company to convert the open dump to a sanitary landfill. The site was unsuitable for landfill because it had only a thin layer of protective soil over a creviced bedrock aquifer and domestic wells were located in the aquifer down-gradient of the site; the State and County advised against the site selection. The thin layer of soil was stripped and waste was disposed in the resulting trench, enabling a free channel of leachate to flow to the wells below. Seven domestic wells were polluted beyond use and two others were severely damaged. The State Department of Public Health and the State Geological Survey sampled the wells, investigated the landfill operations, confirmed that landfill waste was the cause of contamination, and made corrective recommendations. In 1966, a lawsuit was initiated against the city and the Fox Valley Disposal Company by the well owners. Damages were settled in the amount of $54,000 which covered the cost of annexing the area to the township of North Aurora, building a water mainline from North Aurora, hookups to homes, and legal expenses. An incomplete tabulation of the damage costs directly attributable to well contamination amounted to $115,000, but did not include administrative nuisance, and inconvenience costs, and the costs of temporary water for 16 months (all of which were unrecoverable by the plaintiffs). The landfill site continued to operate against State regulations until its closing in 1977. (Seip-IPA)
W78-06754

A TOXONOMIC STUDY OF THE SPONGILLA ALBA, S. CENOTA, S. WAGNERI SPECIES GROUP (PORIFERA: SPONGILLIDAE) WITH ECOLOGICAL OBSERVATIONS OF S. ALBA,
New Orleans Univ., LA. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5A.
W78-06805

A CASE OF CONTAMINATION OF KARST WATER-BEARING STRATA BY CHOLERA VIBRIO (IN RUSSIAN),
Nauchno-Issledovatelskii Protivochumnyi Inst., Rostov-na-Donu (USSR).
G. M. Medinskii, I. D. Ladnyi, K. G. Bichul, A. G. Goncharov, and V. I. Kiseleva.
Gig Sanit 12, p 12-15, 1976.

Descriptors: *Karst, Water pollution sources, *Chlera vibrio, *Bacteria, *Groundwater contamination.

An underground strata bearing sulfide waters apparently was infected with chlorea vibrio. Infection occurred due to the absence of a protection zone and intense contamination of the territory above the water-bearing strata. Sources of infection could be carriers of vibrio among numerous tourists visiting this region from various countries, including those affected with chlorea. The ecological condition prevailing in the underground strata with sulfide waters proved to be favorable forlong survival and multiplication of chlorea vibrio.-Copyright 1978, Biological Abstracts, Inc.
W78-06821

THE USE OF BIOLOGICAL INDICATOR ORGANISMS TO MONITOR TRACE METAL POLLUTION IN MARINE AND ESTUARINE ENVIRONMENTS--A REVIEW,
National Environment Protection Board of Sweden, Upsala. Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W78-06832

BIOAVAILABILITY OF NAPHTHALENES FROM MARINE SEDIMENTS ARTIFICIALLY CONTAMINATED WITH PRUDHOE BAY CRUDE OIL,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Labs.
For primary bibliographic entry see Field 5C.
W78-06834

POLYAROMATIC HYDROCARBONS IN OYSTER FROM COASTAL LAGOONS ALONG THE EASTERN COAST OF THE GULF OF MEXICO, MEXICO,
Universidad Nacional Autonoma de Mexico, Mexico City. Inst. de Geofisica; and Universidad Nacional Autonoma de Mexico, Mexico City. Centro de Ciencias del Mar y Limnologia.
For primary bibliographic entry see Field 5C.
W78-06840

DISTRIBUTION OF N-PARAFFINS IN SEAGRASSES, BENTHIC ALGAE, OYSTERS AND RECENT SEDIMENTS FROM TERMINOS LAGOON, CAMPECHE, MEXICO,
Universidad Nacional Autonoma de Mexico, Mexico City. Centro de Ciencias del Mar y Limnologia.
A. V. Botello, and E. F. Mandelli.
Bulletin of Environmental Contamination and Toxicology, Vol 19, No 2, p 162-170, February 1978. 2 fig, 2 tab, 8 ref.

Descriptors: *Baseline studies, *Water pollution effects, *Mexico, Algae, Oysters, Sediments, Invertebrates, *Terminos Lagoon(Mex), Sea grass, N-paraffins.

The primary purpose of this study is to establish the distribution of biogenic n-paraffins in marine 'sea-grasses', benthic algae, invertebrates and recent sediments from Terminos Lagoon, Campeche, Mexico. Considering the uncontaminated nature of this coastal region the results of this study will provide a basis for the assessment of future man-induced alterations. (Sinha-OEIS)
W78-06842

NET DRIFT IN AN ATYPICAL ESTUARY, LONG ISLAND SOUND,
Naval Ocean Research and Development Activity, Bay St. Louis, MS.
D. F. Paskausky.
Environmental Management, Vol 1, No 4, p 331-342, 1977. 14 fig, 1 tab, 22 ref.

Descriptors: *Baseline studies, *Water pollution, *Waste disposal, Estuaries, New York, Resources development, *Long Island(NY), *Ocean dumping, New York Bight, *Net drift.

A summary of the descriptive near-shore oceanography of Long Island Sound was prepared to assist in an analysis of the environmental impact from

the dumping, in 1974, of dredge material from New Haven harbor at a site five miles south of the harbor. Long Island Sound is an estuary by definition since it is a semi-enclosed body of water having a free connection with the open ocean. It has a two layered flow at the eastern opening (The Race) and a salinity gradient of about five parts per thousand is maintained between the eastern and western extremes. Tidal currents, wind-driven circulation, and river inflow and freshwater influx are investigated as factors affecting the net drift. Current measurements in eastern Long Island Sound indicate that the tidal circulation features that predominate there do not normally affect the net drift at the New Haven dump site. Drifter returns and a numerical model indicate that seasonal prevailing winds seem to be the primary cause of the net drift in central Long Island Sound. (Sinha-OEIS)
W78-06843

DISTRIBUTION OF TAR BALLS ON BAHAMIAN BEACHES,
Canada Centre for Inland Waters, Burlington (Ontario).
J. P. Coakley.
Shore and Beach, Vol 45, No 2, p 31-35, April 1977. 2 fig, 3 tab, 3 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Environmental effects, Beaches, Resources development, Distribution, Path of pollutants, Outer Continental Shelf, Bahamas, *Tar balls, *Grand Bahama Island.

'Tar balls', or rounded masses of semi-solid petroleum residue, stranded on beaches and coasts, are being recognized as a global phenomenon and as alarming indicators of worldwide pollution of the oceans and coastal waters by petroleum discharged of various types. Their impact on tourist-amenity beaches in the tropical regions is considerable, and with the expected rise in petroleum movements by sea, this impact on shoreline recreational and aesthetic resources will undoubtedly increase. The purpose of this paper is to quantify the phenomenon at one locality, Grand Bahama Island, in the Bahamas archipelago, and to attempt to uncover relationships between various physical beach parameters and the incidence of these tar balls. (Sinha - OEIS)
W78-06845

THE LEVELS OF METALS IN DOCK-YARD SEDIMENTS WITH PARTICULAR REFERENCE TO THE CONTRIBUTIONS FROM SHIP-BOTTOM PAINTS,
University of Manchester Inst. of Science and Technology (England). Pollution Research Unit. and Bolton Inst. of Tech. (England).
For primary bibliographic entry see Field 5A.
W78-06848

HYDROCARBONS IN THE MARINE ENVIRONMENT. II. DISTRIBUTION OF N-ALKANES IN THE FAUNA AND ENVIRONMENT OF THE SUB-ANTARCTIC ISLAND OF SOUTH GEORGIA,
Torry Research Station, Aberdeen (Scotland); and British Antarctic Survey, Cambridge (England).
P. R. Mackie, H. M. Platt, and R. Hardy.
Estuarine and Coastal Marine Science, Vol 6, No 3, p 301-313, March 1978. 6 fig, 3 tab, 26 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Antarctic Ocean, Benthos, Sediments, Resources development, Outer Continental Shelf, *South Georgia Island, Hydrocarbons, *N-alkanes, Sub-Antarctic island.

The concentrations and distributions of alkanes have been determined in samples of sediment, fish, benthos and a land plant mixture from King Edward Cove, South Georgia. The fish muscle and water samples exhibited the relatively smooth envelope typical of this type of material whereas the plants, benthos, fish liver and sediments had a strong odd carbon predominance. No trace of fuel oil from previous spills or leaking storage tanks could be found in any of the samples examined although possible evidence of wastes from the whaling station were found in the deepest sediment layers in the centre of the Cove. (See also W75-07894) (Sinha - OEIS)
W78-06849

ACCUMULATION AND ELIMINATION OF DIELDRIN IN MUSCLE TISSUE OF CHANNEL CATFISH,
Iowa State Univ., Ames.
L. Shannon.
Bulletin of Environmental Contamination and Toxicology, Vol. 17, No. 6, p 637-644, 1977. 2 tab, 12 ref. OWRT A-042-IA(5), 14-31-0001-3515; 3815; and 4015.

Descriptors: *Fish physiology, *Catfishes, *Channel catfish, *Dieldrin, *Chlorinated hydrocarbon pesticides, Metabolism, Organic compounds, Biochemistry, Mode of Action, Path of pollutants, Bioassay, Halogenated pesticides, *Bioaccumulation, Muscle tissue, Tissue analysis, Fish food.

Dieldrin accumulation and elimination in muscle tissue of channel catfish (Ictalurus punctatus) from water and food was determined in the laboratory. Twenty-eight-day exposure of fish 150-225 mm and 350-400 mm long to 75 parts per trillion (ng/liter) dieldrin resulted in the larger catfish consistently accumulating more dieldrin than the smaller fish. After 28 days of elimination, dieldrin levels in both size groups were nearly equal. Catfish exposed to 2 ppm (mg/kg) dieldrin through their diets accumulated significantly more dieldrin in muscle than did fish exposed to 74 pptr in water. When fish were exposed to dieldrin both in food and water, dieldrin from both sources contributed to the total dieldrin load. (Katz)
W78-06853

THE RELATIONSHIP BETWEEN LIGHT AND PHOTOSYNTHETIC RATE IN A RIVER COMMUNITY AND IMPLICATIONS FOR WATER QUALITY MODELING,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 5C.
W78-06854

CONTAMINANT INPUTS TO THE NEW YORK BIGHT,
National Oceanic and Atmospheric Administration, Boulder, CO. Marine Ecosystems Analysis Program.
J. A. Mueller, J. S. Jeris, A. R. Anderson, and C. F. Hughes.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 063, Price codes: A16 in paper copy, A01 in microfiche. NOAA Technical Memorandum ERL MESA-6, April 1976. 358 p, 30 fig, 41 tab, 15 append.

Descriptors: *Water pollution sources, *Waste disposal, New York, Sewage, Municipal wastes, Industrial wastes, Heavy metals, Outer Continental Shelf, *New York Bight, Ocean dumping.

An estimate of the location and magnitude of contaminant inputs into the New York Bight is presented, their relative importance indicated, and data gaps identified. Four sources of contaminant inputs were evaluated in the study: barge dumps and atmospheric fallout as direct bight inputs, and wastewater and runoff as coastal inputs to waters ultimately draining to the bight. The sources were further subdivided into their various constituents: dredge spoils, sewage sludge, acid wastes, chemical wastes and rubble for the barge dumps; gaged stream flow, urban runoff, and groundwater outflow for the runoff, and municipal and industrial wastewater inputs. The wastewater inputs were evaluated only downstream of the gaged stream stations because all inputs above these points are reflected in the gaged runoff values. In addition to flow or volume for each source, 23 separate contaminants were investigated to estimate the inputs of solids, organic matter, nutrients, heavy metals, and microbes. Because of their usefulness in water quality modeling, the raw dredge spoil, wastewater discharge, and gaged runoff data for each source are included as appendixes in this report. (Sinha-OEIS)
W78-06858

OIL SPILL: DECISIONS FOR DEBRIS DISPOSAL. VOL I: PROCEDURES MANUAL,
SCS Engineers, Long Beach, CA.
For primary bibliographic entry see Field 5G.
W78-06859

OIL SPILL: DECISIONS FOR DEBRIS DISPOSAL. VOL II, LITERATURE REVIEW AND CASE STUDY REPORTS,
SCS Engineers, Long Beach, CA.
For primary bibliographic entry see Field 5G.
W78-06860

OIL SPILL AND OIL POLLUTION REPORTS, FEBRUARY-1977 -APRIL 1977,
California Univ., Santa Barbara. Marine Science Inst.
For primary bibliographic entry see Field 5G.
W78-06861

THE METULA OIL SPILL,
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Lab.
C. G. Gunnerson, and G. Peter.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 418, Price codes: A15 in paper copy, A01 in microfiche. NOAA Special Report, September 1976. 336 p, 2 append.

Descriptors: *Oil spills, *Oil pollution, *Water pollution sources, Environmental effects, Water pollution effects, South America, *Outer Continental Shelf, Tanker ships, Oil transport, *METULA oil spill, Crude oil, *Strait of Magellan.

In August 1974 the supertanker METULA ran aground in the Strait of Magellan and spilled over 50,000 tons of light Arabian crude oil. The spill was not contained and the oil was carried over large segments of beaches and tidal marshes of Tierra del Fuego, and deep into the estuaries of the area. Findings of a team of scientists from the United States and Chile, who investigated the environmental damage in August 1974 and again in January 1975, and of others who discussed the spill at a workshop, are summarized. Included are the background of the accident, the physical environment, the reasons why cleanup measures were not attempted, and the most important follow-up research needs. The research results will be used to identify critical environmental information that can be transferred for use in palnning and for predicting environmental impacts in the other similar areas of the world. (Sinha-OEIS)
W78-06862

POTENTIAL MARICULTURE YIELD OF FLOATING SEA THERMAL POWER PLANTS. PART 1--GENERAL STATEMENT,
Lamont-Doherty Geological Observatory, Palisades, NY.; and City Univ. of New York. Inst. of Marine and Atmospheric Science.
For primary bibliographic entry see Field 5C.
W78-06864

COPPER IN THE SEA - A BIBLIOGRAPHY,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Lab.
For primary bibliographic entry see Field 5C.
W78-06865

THE UTILITY OF SKYLAB PHOTO-INTERPRETED EARTH RESOURCES DATA IN STUDIES OF MARINE GEOLOGY AND COASTAL PROCESSES IN PUERTO RICO AND THE VIRGIN ISLANDS,
Geological Survey, San Juan, PR.
J. V. A. Trumbull.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-27631, Price codes: A07 in paper copy, A01 in microfiche. Final Report on Investigation of SKYLAB EREP Data, 1975. 143 p, 19 fig, 4 append.

Descriptors: Water resources, *Baseline studies, *Photography, *Sediment transport, *Waste disposal, *Oil spills, Pollutant identification, Water pollution sources, Estuaries, Coasts, Effluents, Benthos, Outer Continental Shelf, *SKYLAB photography, Pollutant transport, Earth resources data, Environmental conditions, Coastal processes.

Three SKYLAB earth-resources passes over Puerto Rico and St. Croix on 6 June and 30 November 1973 and 18 January 1974 resulted in color photography (Earth Terrain Camera) and multispectral photography and scanner imagery that contains a wealth of data useful in a number of fields of study. Bathymetric detail to a limiting depth of 84 feet (26 meters) is well-shown in clear-water areas and could be used to make contoured charts by means of image-enhancement techniques and some field control. Bathymetric and turbid-water features are differentiable by use of the multispectral data. The photography allows mapping of coral reefs, offshore sand deposits, areas of coastal erosion, and patterns of sediment transport. Patterns of bottom-dwelling biologic communities are well portrayed but are difficult to differentiate from bathymetric detail. Much detailed information on patterns of coastal surface water currents can be readily extracted from images taken at times of high water turbidity. Anomalous large-scale offshore-oriented plumes undetected by other means appear on the photography. Effluent discharges and oil slicks are readily detected and are differentiated from other phenomena by the persistence of their images into the longer-wavelength multispectral bands. The SKYLAB data make up a valuable benchmark inventory of a variety of coastal conditions that will be of great future value in the study of slowly time-variant phenomena. (Sinha-OEIS)
W78-06867

A REVIEW OF OIL POLLUTING INCIDENTS IN AND AROUND NEW ENGLAND,
Environmental Research Lab., Narragansett, RI.
J. L. Hyland.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 698, Price codes: A03 in paper copy, A01 in microfiche. EPA Office of Research and Development, Ecological Research Series No EPA-600/3-77-064, June 1977. 41 p, 6 tab, 39 ref.

Descriptors: *Oil pollution, *Oil spills, Water pollution sources, *New England, *Outer Continental Shelf.

A comprehensive review of oil pollution incidents in and around New England waters is offered. The first section of the report presents an analysis of all oil discharge data maintained by the U.S. Coast Guard for years 1973 through 1975. The data are analyzed categorically to reveal where most spills occur in New England waters, where the greatest quantities are spilled, what types of oil are most frequently spilled, what types are spilled in the greatest quantities (in gallons), what the most significant sources and causes of spills are, and within which size range (in gallons) most spills occur. The second section offers synopses of the more publicly recognized spills which have occurred within the last twenty-five years. The management of oil discharges and areas in which additional research is required are discussed in a concluding section. (Sinha-OEIS)
W78-06868

COPPER.
National Research Council, Washington, DC. Committee on Medical and Biologic Effects of Environmental Pollutants.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 425, Price codes: A09 in paper copy, A01 in microfiche. Report No. EPA-600/1-77-003, Jan 1977. 6 tab, 638 ref, 1 append. EPA, Research Triangle Park, NC. Health Effects Research Laboratory Office of Research and Development. EPA 68-02-1226.

Descriptors: *Copper, *Public health, *Copper compounds, *Toxicity, *Environment, Air pollution effects, Inorganic compounds, Diets, Human pathology, Poisons, Air pollution, Trace elements, Pollutants, Chemical properties, Ecology, Water quality, Toxins.

This report was a review of current knowledge of the distribution of copper in the environment and living things. Metabolism and the effects of copper in the biosphere also were considered. Copper compounds are common and widely distributed in nature. They also are mined, processed, and redistributed extensively by man. Copper is an essential element in plant and animal nutrition. It is related closely to iron, sulfur, and molybdenum in animal metabolism. Requirements differ in relation to the nutritional state of these other elements. In plants, copper toxicity is infrequent and usually results from soil contamination due to human activities. Deficiency in plants is fairly common and may require supplementation for crops. In animals, both deficiency and toxicity are infrequent, except in ruminants. Human copper poisoning occurs rarely in industry as a cause of food poisoning, resulting from some medical treatments and from genetic defects in metabolism. Copper levels found in food, water, and air have not been found to be injurious. (Henley-ISWS)
W78-06872

SALT REGIME OF RESERVOIRS, CHAPTER 6: ELEMENTARY HYDROBIOLOGICAL PROGNOSIS,
For primary bibliographic entry see Field 5C.
W78-06880

THE BEHAVIOUR OF DISSOLVED ALUMINUM IN ESTUARINE AND COASTAL WATERS,
University of East Anglia, Norwich (England). School of Environmental Science.
D. J. Hydes, and P. S. Liss.
Estuarine and Coastal Marine Science, Vol. 5, No. 6, p 755-769, November 1977. 9 fig, 5 tab, 25 ref.

Descriptors: Aluminum, *Estuarine environment, *Adsorption, *Solubility, *Estuaries, Water chemistry, Clays, Analytical techniques, Chemical properties, Coasts, Water analysis, Mixing, Salinity, Physical properties, Saturation, Water quality, *Aluminum solubility, Coastal waters, *Aluminum compounds, Aluminum species, British Isles, *North Sea, Estuarine mixing, Chlorosity, Dissolved aluminum.

The average concentration of dissolved aluminum found in surface waters of the North Sea with salinities greater than 34 parts/thousand was 1.5 micrograms/l, with a range of from 5.5 to 0.5 micrograms/l. The distribution appeared to be a function of the amounts of aluminum in, and the distribution of, the freshwater inputs. Values decreased away from coastal regions and suggest an oceanic value for dissolved aluminum of 1.0 micrograms/l, or less. Freshwaters from the Rivers Great Ouse an Yare in East Anglia are basic (pH about 8.0) and contain 2-5 microgram al/l. Samples of freshwater (pH 6.5-7.9) collected from the drainage basin of the River Conway (North Wales) contain from 4 to 98 microgram al/l. Approximately 30% of the dissolved aluminum entering the Conway Estuary in freshwater appears to be removed during mixing with seawater in the estuary. Removal occurs during the early stages of mixing, being essentially complete by the time the water has reached a salinity of 8 parts/thousand. The most probable explanation for the effect is one involving trapping of aluminum adsorbed on the surface of very fine clay particles entering with the freshwater as the particles are irreversibly coagulated on mixing with saline water in the estuary. (Henley-ISWS)
W78-06893

THE SOURCES OF DISSOLVED MANGANESE TO CALICO CREEK, NORTH CAROLINA,
North Carolina Univ. at Chapel Hill. Curriculum in Marine Sciences.
J. G. Sanders.
Estuarine and Coastal Marine Science, Vol. 6, No. 2, p 231-238, February 1978. 5 fig, 1 tab, 23 ref.

Descriptors: *Manganese, *Dissolved solids, *Tidal streams, *Water pollution sources, *North Carolina, Tidal waters, Coasts, Sediments, Salinity, Hydrogen ion concentration, Dissolved oxygen, Sampling, Data processing, Rainfall, Runoff, Sewage effluents, Pollutants, Path of pollutants, Estuaries, *Calico Creek(NC).

A small tidal creek in North Carolina, during the spring and summer months, has dissolved Mn concentrations in excess of concentrations predicted by simple mixing with the nearby Newport River. The majority, approximately 80%, of the Mn excess is derived from pore waters upon resuspension of the sediments by storms, and perhaps by tidal scouring and bioturbation. Sewage effluent is the only source other than the sediments that releases a significant amount (15%) of the Mn excess to the creek. Molecular diffusion of Mn across the sediment-water interface is not an important process. Rainfall, runoff from the watershed, atmospheric fallout, and the biota are all unimportant sources. (Sims-ISWS)
W78-06895

OVERVIEW OF MARINE POLLUTION RESEARCH IN EGYPT,
Alexandria Inst. of Oceanography and Fisheries (Egypt).
For primary bibliographic entry see Field 5G.
W78-06911

OVERVIEW ON POLLUTION IN THE COASTAL ENVIRONMENT OF PAKISTAN AND ITS POSSIBLE IMPLICATION FOR THE MARINE ECOSYSTEM,
Karachi Univ. (Pakistan). Inst. of Marine Biology.
For primary bibliographic entry see Field 5G.
W78-06912

OVERVIEWS ON MARINE POLLUTION IN INDIA,
University of West Florida, Pensacola. Dept. of Biology.
For primary bibliographic entry see Field 5G.
W78-06913

HYDROLOGICAL, CHEMICAL AND PHYSICAL PROCESSES AFFECTING POLLUTION OF THE BALTIC SEA,
Institute of Meteorology and Water Management, Gdynia (Poland).
A. Trzosinska.

In: 'Proceedings of the International Symposium on Marine Pollution Research Held in Gulf Breeze, Florida on Jan 27-29, 1976,' Environmental Protection Agency, Office of Research and Development Report No EPA-600/9-76-032, January 1976. p 69-79, 11 fig, 2 ref.

Descriptors: *Water pollution, *Water properties, *Resources development, Industrial wastes, Heavy metals, Chlorinated hydrocarbons, Hydrology, *Baltic Sea, Gdansk Basin.

The Maritime Branch of the Institute of Meteorology and Water Management in 1974 undertook a research project on 'Hydrological, Chemical and Physical Processes Affecting Pollution of the Baltic Sea,' sponsored by the U.S. Environmental Protection Agency. The Gdansk Basin was chosen as the principal study area. Cities at the Gulf of Gdansk have about one million population; these are the 'Three-Towns' of Gdansk, Gdynia and Sopot, with a population of 700,000. A complex of shipbuilding, metal and electrical engineering, oil refinery, chemical and food industries exists, all being developed intensively. The objectives of the Gdansk Basin study program involve two types of water constituents: compounds closely related to the eutrophication process, such as nutrients, organic phosphorus, organic nitrogen and oxygen; and noxious substances, such as chlorinated hydrocarbons and heavy metals. The investigations covered by the current program emphasize the primary sources of marine pollution, with river discharges and the atmosphere, including water dynamics, being the decisive factor for the spreading of pollutants at sea. In this respect an attempt was made to obtain a provisional balance of selected pollutants. (See also W78-06906) (Sinha-OEIS)
W78-06915

GLOBAL MONITORING OF MARINE POLLUTANTS,
Scripps Institution of Oceanography, La Jolla, CA.
For primary bibliographic entry see Field 5A.
W78-06922

APPLICATION OF DIGITAL PROFILE MODELING TECHNIQUES TO GROUNDWATER SOLUTE TRANSPORT AT BARSTOW, CALIFORNIA,
Geological Survey, Lakewood, CO. Water Resources Div.
S. G. Robson.
Available from Supt. of Documents, GPO, Washington, DC 20402, Price $1.90. Geological Survey Water-Supply Paper 2050, 1978. 28 p, 9 fig, 1 plate, 31 ref.

Descriptors: *Groundwater movement, *Solutes, *Dissolved solids, *Path of pollutants, *Model studies, Water pollution control, Aquifers, Analytical techniques, Sewage effluents, *Digital profile modeling, *Barstow(Calif).

A two-dimensional profile-oriented water-quality model was used for the simulation of head and water-quality changes through the saturated thickeness of an aquifer. The profile model is able to simulate confined or unconfined aquifers with nonhomogeneous anisotropic hydraulic conductivity, nonhomogeneous specific storage and porosity, and nonuniform saturated thickness. An aquifer may be simulated under either steady or nonsteady flow conditions. Although the profile model has the advantage of being able to simulate vertical flow and water-quality changes in a single- or multiple-aquifer system, the types of problems to which it can be applied is limited by the requirements that (1) the ground-water flow path remain oriented along the longitudinal axis of the model and (2) any subsequent hydrologic factors to be evaluated using the model must be located along the land-surface trace of the model. Simulations of the movement and dissolved-solids concentration of a zone of degraded ground-water quality near Barstow, Calif., indicate that halting subsurface disposal of treated sewage effluent in conjunction with pumping a line of fully penetrating wells would be an effective means of controlling the movement of degraded ground water. (Woodard-USGS)
W78-06931

PROGRAM FOR EVALUATING STREAM QUALITY IN NORTH CAROLINA,
Geological Survey, Raleigh, NC. Water Resources Div.
H. B. Wilder, and C. E. Simmons.
Available from Branch of Distribution, USGS 1200 S. Eads St. Arlington, VA 22202. Circular 764, 1978. 16 p, 13 fig, 3 tab, 16 ref.

Descriptors: *Water quality, *North Carolina, *Streams, *Evaluation, Analytical techniques, Water analysis, Natural streams, Water pollution sources, Streamflow, Flow rates, High flow, Low flow, Hydrograph analysis, Environmental effects, Estimating, Constituent loads, Water quality trends, Natural water quality, Pollution loads.

The design and objectives of the program for evaluating stream quality in North Carolina are described. Using water-quality and streamflow data collected since the 1940's, a study is underway to define certain variations in water quality, to quantify the effects of man's activities on water quality, and to determine long-term trends at key locations on the State's major river. Data collected from 47 unpolluted stream sites were used to estimate average concentrations for naturally occurring constituents during periods of high and low flow. Methods are described for estimating constituent loads derived from both natural sources and sources of pollution. (Woodard-USGS)
W78-06939

EVALUATION OF HYDROGEOLOGIC ASPECTS OF PROPOSED SALINITY CONTROL PROGRAM IN PARADOX VALLEY, COLORADO,
Geological Survey, Denver, CO. Water Resources Div.
For primary bibliographic entry see Field 5G.
W78-06942

MODEL ANALYSIS OF THE IMPACT ON GROUND-WATER CONDITIONS OF THE MUSKEGON COUNTY WASTEWATER DISPOSAL SYSTEM, MICHIGAN,
Geological Survey, Lansing, MI. Water Resources Div.
M. G. McDonald, and W. B. Fleck.
Open-file report 78-99, January 1978. 63 p, 17 fig, 1 tab, 14 ref.

Descriptors: *Groundwater movement, *Computer models, *Waste water disposal, *Drainage systems, *Michigan, Tiles, Sprinkler irrigation, Lagoons, Aquifer characteristics, Aquitards, Groundwater recharge, Hydrogeology, Numerical analysis, Evaluation, *Muskegon County(Mich).

A digital model was developed to study the impact on ground-water conditions of the Muskegon County, Mich., wastewater disposal system. At the disposal site, wastewater is stored in two 850-acre lagoons and then spray-irrigated on crop land. About 70 miles of drainage tile, which underlies the irrigated land, has caused the water table to be lowered substantially. The decline in water levels has been partially offset by irrigation and leakage from the lagoons; at some places the water table is higher than it was prior to construction. Predictive simulations by the model were used to study the effects of varying tile drainage, amount of irrigation water applied, lagoon leakage, and natural ground-water recharge. If the effectiveness of the tile to collect drainage is reduced by 75 percent, large areas within the wastewater site would become waterlogged. However, the effect outside of the wastewater site would be negligible. (Woodard-USGS)
W78-06943

WATER-QUALITY INVESTIGATION OF THE TYRONZA RIVER WATERSHED, ARKANSAS,
Geological Survey, Little Rock, AR. Water Resources Div.
T. E. Lamb.
Geological Survey open-file report 78-175, 1978. 32 p, 4 fig, 8 tab, 9 ref.

Descriptors: *Water quality, *Baseline studies, *Surface waters, *Agricultural watersheds, *Arkansas, Aquifers, Potentiometric level, Topography, Geology, Water analysis, Sampling, Chemical analysis, Physical properties, Chemical properties, Bottom sediments, Pesticides, *Tyronza River basin(Ark), *Pre-soil conservation programs.

The results of a 1-year study of surface-water quality in the Tyronza River Watershed, Arkansas, are presented to document conditions before implementation of Soil Conservation Service Programs. The report includes a general description of the watershed's topography, geology, and aquifers, and the results of monthly measurements of discharge at five sites, and several physical and chemical parameters, plus quarterly analyses for several ions and semiannual analyses of bottom material for various pesticides. The results indicate that the quality of the water in the streams and ditches samples is normal for an intensely farmed area such as this watershed. (Woodard-USGS)
W78-06951

GROUNDWATER QUALITY AND CORROSION: THE AUSTRALIAN SCENE,
G. J. Kelly.
In: Groundwater Quality--Measurement, Prediction and Protection. Proc. of the Water Research Centre Conference, September 6-8, 1976, Univ. of Reading, Berks., England, p 470-485. (1976) 1 fig, 2 tab, 14 ref.

Descriptors: *Groundwater, *Australia, *Corrosion control, *Pumps, Iron, Steel, Stainless steel, Water quality, Dissolved oxygen, Carbon dioxide, Electrolysis, Water analysis, Sampling, Acidity.

The general aridity of the Australian continent make its ground water resources especially valuable and heavily-used for water supply. Increasing concern by pump owners about unsatisfactory and unpredictable performance due to corrosion has highlighted the need for more accurate characterization of ground water quality, particularly with respect to 'unstable' variables which are primarily dependent on the partial pressure of oxygen and carbon dioxide. In addition, Australian ground waters are generally dominated by sodium and chloride, or sodium and bicarbonate, so that for the same conductivity and pH, they are more corrosive than the ground waters of Europe and North America for which rules-of-thumb for pump materials selection have been developed. Use of alternatives to cast iron and steel for various pump components could prove to be a major cost-saving tactic in the long run; austenitic stainless steel is highly promising despite considerable initial cost. Pump column corrosion appears to be as much a design problem as anything else. Some form of cathodic protection may ultimately be the best solution for such difficulty. (Eberle-NWWA)
W78-06973

LEGISLATIVE ASPECTS OF GROUNDWATER QUALITY,
For primary bibliographic entry see Field 5G.
W78-06974

MEASURES FOR THE PROTECTION AND REHABILITATION OF AQUIFERS IN THE UNITED KINGDOM,
For primary bibliographic entry see Field 5G.
W78-06975

SATELLITE REMOTE SENSING STUDY OF THE TRANS-BOUNDARY MOVEMENT OF POLLUTANTS,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 5A.
W78-06979

OIL SPILL AND OIL POLLUTION REPORTS, MAY 1977 - JULY 1977,
California Univ., Santa Barbara. Marine Science Inst.
For primary bibliographic entry see Field 5G.
W78-06980

HYDROCARBONS IN SEDIMENTS AND BENTHIC ORGANISMS FROM A DREDGE SPOIL DISPOSAL SITE IN RHODE ISLAND SOUND,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
P. D. Boehm, and J. G. Quinn.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 732, Price codes: A03 in paper copy, A01 in microfiche. U.S. Environmental Protection Agency, Office of Research and Development, Ecological Research Series No EPA-600/3-77-092, November 1977. 46 p, 7 fig, 6 tab, 34 ref. Grant No R803415.

Descriptors: *Oil pollution, *Water pollution sources, Rhode Island, Sediments, *Outer Continental shelf, *Hydrocarbons, *Ocean dumping, Quahog, Acartia islandica.

A three-year study to investigate the spatial distribution of hydrocarbons both in surface sediments from upper Rhode Island Sound and in a commercially important shellfish from the area, the ocean quahog (Acartia islandica) is described. An attempt is made to distinguish the regular hydrocarbon geochemistry of Rhode Island Sound, defined by background hydrocarbon distributions and inputs from Narragansett Bay and adjacent coastal areas, from the input due to mobilization of hydrocarbons from a deposited dredge spoil during the five years since the disposal activity has ceased. (Sinha-OEIS)
W78-06982

OFFSHORE OIL AND GAS EXTRACTION: AN ENVIRONMENTAL REVIEW,
Battelle Columbus Lab., OH.
N. A. Frazier, D. L. Maase, and R. Clark.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 242. Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency, Office of Research and Development, Interagency Energy-Environment Research and Development Series No EPA-600/7-77-080, July 1977. 69 p, 1 fig, 25 tab, 42 ref. EPA-68-02-1323.

Descriptors: *Water pollution sources, *Environmental effects, *Oil spills, *Oil pollution, *Metals, Air pollution, Resources development, Exploitation, *Outer Continental shelf, Offshore drilling.

The results of an environmental review of emission sources and emissions associated with U.S. offshore oil and gas exploration, drilling, and production are reported. The purpose of the review was to rank technological problems of controlling these emissions. Existing or proposed effluent limitations reflect BPTCA and BATEA technologies for controlling oil in effluents to near and offshore waters. No firm basis could be developed for ranking technological problems of controlling other possible emission to the environment. Conclusions of the small study are that additional information is needed on the fate and effect of other possible pollutants, mainly metals, that might be in discharges to offshore waters and on quantitative evaluations of air emission sources. In the information reviewed, greatest environmental concern was with accidental spills of oil that can occur during drilling and production. Little or no environmental concern with air emission sources was noted in the information reviewed. (Sinha-OEIS)
W78-06983

EVALUATION OF FACTORS PROMOTING THE PRESERVATION OF AQUATIC ECOSYSTEMS IN RECLAIMED STRIP MINE AREAS,
Grover City Coll., PA. Dept. of Biology.
For primary bibliographic entry see Field 5G.
W78-06998

MOVEMENT OF PESTICIDES IN THE SOIL WATER FERTILIZER SYSTEM,
Arkansas Univ., Fayetteville. Dept. of Agronomy.
H. D. Scott.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 498. Price codes: A06 in paper copy, A01 in microfiche. Arkansas Water Resources Research Center, Publication No. 35, July 1975. 101 p, 36 fig, 18 tab, 43 ref, append. OWRT A-021-ARK(1), 14-31-0001-3804.

Descriptors: *Path of pollutants, Herbicides, *Captina silt loam, *Metribuzin, *Chlorides, Soil profiles, Water pollution sources, *Microbial degradation, Soil treatment, Arkansas, *Pesticide residues.

A theoretical and experimental study of the transport of pesticides was conducted in several Arkansas soils with metribuzin, a herbicide. In a field study, chloride and metribuzin were applied to a Captina silt loam under maximum leaching conditions and their redistribution was compared with that of soil water. Metribuzin was found in significantly detectable quantities to a depth of 61 cm; the largest concentrations were detected in the surface 23 cm and particularly in the 0-5 cm increment. Two days after application 72.6 and 33.6% could be detected in the vegetation and no-vegetation plots. The metribuzin half life was 7.88 and 5.13 days in the no-vegetation and vegetation plots, respectively. Chloride was found throughout the profile Metribuzin and chloride generally were observed to move in the same direction as soil water, but at a considerably slower rate. Persistence of metribuzin within the soil was influenced greatly by microbial degradation. The laboratory studies centered on further quantifying the transport and adsorption-desorption parameters of metribuzin under controlled environmental conditions. Diffusion coefficients of 14C-metribuzin, 36Cl, and 3HOH were shown to be influenced by soil type, soil water content, and soil temperature. The magnitude of the diffusivities were in the order 3HOH>36Cl>14C-metribuzin; however, the ratios varied. The rates of adsorption of metribuzin were found to be dependent on shaking time and soil type. For the most part linear adsorption isotherms were observed. Desorption rates were found to be influenced by solution concentration, shaking time and soil type.
W78-06999

PO210 AND PB210 IN ZOOPLANKTON FECAL PELLETS,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
T. M. Beasley, M. Heyraud, J. J. W. Higgo, R. D. Cherry, and S. W. Fowler.
Marine Biology, Vol. 44, p 325-328, 1978. 1 tab, 21 ref.

Descriptors: *Lead, *Zooplankton, *Suspended solids, *Radium radioisotopes, *Lead radioisotopes, *Radioisotopes, *Isotope studies, *Path of pollutants, Water pollution sources, Sea water, *Polonium, *Meganyctiphanes.

210Po and 210Pb concentration is fecal pellets from the zooplankton euphausiid Meganyctiphanes norvegica are reported. The 210Po:210Pb activity ratio is 2.2 · or - 0.3, a value in good agreement with that found in suspended particulate matter in surface seawater. Estimates of 210Po and 210Pb removal times from the mixed layer by fecal pellets alone yield values which are of the same order of magnitude as the removal time for these nuclides by all routes. It is suggested that there is a high probability that zooplanktonic fecal pellets play a significant role in the removal of both these nuclides from the surface layers of the ocean. (Deal-EIS)
W78-07018

OIL SPILL DISPERSANTS CAUSE BRADYCARDIA IN A MARINE FISH,
Fisheries and Marine Service, Saint John's (Newfoundland).
For primary bibliographic entry see Field 5C.
W78-07019

SIZE-SELECTIVE MORTALITIES OF CLAMS IN AN OIL SPILL SITE,
Maine State Dept. of Marine Resources, Augusta.
For primary bibliographic entry see Field 5C.
W78-07020

REQUIEM FOR A RIVER. POLLUTION OF THE MOISIE AND PEKANS RIVER,
For primary bibliographic entry see Field 5C.
W78-07022

MAN-MADE DEBRIS ON THE BERING SEA FLOOR,
Alaska Univ., College. Inst. of Marine Science.
H. M. Feder, S. C. Jewett, and J. R. Hilsinger.
Marine Pollution Bulletin, Vol 9 No 2, p 52-53, 1978. 1 fig, 1 tab, 1 ref.

Descriptors: *Oil industry, *Exploration, *Drilling, Surveys, Trawling, *Benthic fauna, Wastes, *Waste identification, International waters, Invertebrates, On-site investigation, Commercial fishing, Waste disposal, *Bering Sea, *Debris(Sea floor).

Proposed oil development in the Bering Sea has led to intensive biological assessment surveys there. A benthic trawl, used to collect bottom invertebrates and fishes in these surveys also brings up any man-made debris in its path. A description of this debris, its distribution, and frequency of occurrence are given for the southeastern Bering Sea in 1975 and 1976. (Deal - EIS)
W78-07033

PLANNING DIFFUSE POLLUTION CONTROL: AN ANALYTICAL FRAMEWORK,
Williams Coll., Williamstown, MA. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-07042

A MANUAL OF MARSH AND AQUATIC VASCULAR PLANTS OF NORTH CAROLINA WITH HABITAT DATA,
North Carolina Agricultural Experiment Station, Raleigh.
For primary bibliographic entry see Field 2I.
W78-07062

SEASONAL GROWTH AND FOLIAR NUTRIENTS OF LARIX LARICINA IN THREE WETLAND ECOSYSTEMS,
Michigan Univ., Ann Arbor. Wetlands Ecosystem Research Group.
For primary bibliographic entry see Field 2I.
W78-07065

ATMOSPHERIC DISPERSION CHARACTERISTICS IN COASTAL ENVIRONMENTS,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 5A.
W78-07083

TIDAL RESUSPENSION IN BUZZARDS BAY, MASSACHUSETTS, I. SEASONAL CHANGES IN THE RESUSPENSION OR ORGANIC CARBON AND CHLOROPHYLL A,
New Hampshire Univ., Durham. Dept. of Zoology.
M. R. Roman, and K. R. Tenore.
Estuarine and Coastal Marine Science, Vol. 6, No. 1, p 37-46, January 1978. 6 fig, 23 ref. NSF DES75-10025, GA-39911.

Descriptors: *Tides, *Chlorophyll, *Organic matter, *Massachusetts, Tidal waters, Coasts, Suspended solids, Currents(Water), Tidal effects, Seasonal, Annual, Cycles, Primary productivity, Sampling, Benthic fauna, Zooplankton, Phytoplankton, Marine biology, Estuaries, *Organic carbon, *Buzzard's Bay(Mass).

Greater than 50% increases in the amount of particulate organic carbon and chlorophyll a per square meter occurred in a 13-m water column of Buzzards Bay during tidal cycles. The composition and quantity of the resuspended material varied seasonally. Greater percentages of the carbon in the water column were resuspended during the summer and winter months, while more resuspension of chlorophyll a occurred during spring and summer. Increases in the amount of primary production in the water column occurred with the resuspension of chlorophyll am indicating that the resuspended cells were viable. The contribution of this resuspended phytoplankton to the total yearly primary productivity can be significant. The tidal resuspension of phytoplankton and detritus from the mud bottom of Buzzards Bay, if utilized by the zooplankton community, could provide significant food resources for secondary production. (See also W78-07096) (Sims-ISWS)
W78-07095

TIDAL RESUSPENSION IN BUZZARDS BAY, MASSACHUSETTS, II. SEASONAL CHANGES IN THE SIZE DISTRIBUTION OF CHOROPHYLL, PARTICLE CONCENTRATION, CARBON AND NITROGEN IN RESUSPENDED PARTICLE MATTER,
New Hampshire Univ., Durham. Dept. of Zoology.
M. R. Roman.
Estuarine and Coastal Marine Science, Vol. 6, No. 1, p 47-53, January 1978. 4 fig, 1 tab, 25 ref. NSF DES75-10025, GA-39911.

Descriptors: *Suspended solids, *Particle size, *Plankton, *Massachusetts, *Organic matter, *Chlorophyll, Sampling, Nutrients, Variability, Seasonal, Tides, Tidal waters, Tidal effects, Phytoplankton, Zooplankton, Biomass, Marine biology, Estuaries, Organic carbon, *Buzzards Bay(Mass).

Seasonal changes in the particle size spectrum of suspended matter in near bottom water of Buzzards Bay was studied by fractional filtration. The greatest fraction of the total particulate organic carbon and particulate organic nitrogen throughout the year was less than 20 micrometers. The relative indepedence of the seasonal size distribution of particulate carbon to changes in the chlorophyll, as well as high carbon:nitrogen ratios during winter, suggest that large amounts of detritus are present in Buzzards Bay. Chlorophyll distribution was dominated by nanoplankton grazers abundant. The winter and fall phytoplankton blooms were dominated by individual and chain-forming diatoms greater than 53 micrometers. The dominance of a nanoplankton and nanodetritus (less than 20 micrometers) in the suspended matter of Buzzards Bay suggests that the major source of nutrition for filter feeding zooplankton are small particles. (See also W78-07095) (Sims-ISWS)
W78-07096

STATUS OF GROUNDWATER CONTAMINATION IN THE US,
Geraghty and Miller, Inc., Tampa, FL.
J. J. Geraghty, and D. W. Miller.
Journal of the American Water Works Association, Vol. 70, No. 3, p 162-167, March 1978. 11 fig.

Descriptors: *Groundwater, *Water pollution, *Water pollution sources, Pollutants, Path of pollutants, Industries, Industrial wastes, Solid wastes, Waste disposal, Waste disposal wells, Waste water disposal, Sludge disposal, Septic tanks, Cesspools, Oil wastes, Mine water, Feed lots, Groundwater contamination.

There are different types of aquifers and still more methods for polluting them. Some sources of pollution, such as septic systems, are obvious, others are less so. Major problems today are being caused by water table depletion and water reinjection into earth cavities created by removal of oil and gas. Potential groundwater contaminants also exist in the form of industrial-waste lagoon systems. The author cited existing data to explain the relative seriousness of each of the problems, and he explained what is being done to overcome the situations. (Sims-ISWS)
W78-07103

THE EFFECTS OF SOLID WASTE LANDFILL LEACHATES ON RECEIVING WATERS,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
R. D. Cameron.
Journal of the American Water Works Association, Vol. 70, No. 3, p 173-176, March 1978. 1 fig, 5 tab.

Descriptors: *Landfills, *Leachate, *Solid wastes, Water pollution, Water pollution effects, Surface waters, Groundwater, Pollutants, Path of pollutants, Leaching, Chemicals, Chemical analysis, Precipitation(Atmospheric), Runoff, Infiltration, Soil water movement.

Leachate from solid waste landfills may contain contaminants that can reach surface and groundwaters. The types and sources of contaminants were discussed, and the factors that influence their entry to ground and surface waters were explored. The author described the potential problems of leachate contaminants and stressed that solid waste landfills can be designed and operated to minimize these problems. (Sims-ISWS)
W78-07104

NORTHEASTWARD DRIFT IN THE NORTHERN MID-ATLANTIC BIGHT DURING LATE SPRING AND SUMMER 1976,
National Ocean Survey, Rockville, MD.
For primary bibliographic entry see Field 2L.
W78-07108

WATER QUALITY AT A SLUDGE ENTRENCHMENT SITE,
Agricultural Research Service, Beltsville, MD. Soil Nitrogen Lab.
L. J. Sikora, C. M. Murray, N. H. Frankos, and J. M. Walker.
Ground Water, Vol. 16, No. 2, p 96-104, March-April 1978. 4 fig, 4 tab, 10 ref.

Descriptors: *Water quality, *Sludge disposal, *Sewage sludge, On-site investigations, Observation wells, Tile drainage, Leachate, Nitrogen, Nitrogen compounds, Nitrates, Chlorides, Pollutants, Water pollution, Path of pollutants, Groundwater, Drainage.

Surface water and groundwater quality were evaluated at a site before and for four years after the area was used for entrenchment of sewage sludge. The soils in the area are sandy and are underlain by a clay barrier. Depth of the water table which in most instances is above the clay barrier is from 1.0 to 13.0 m. Water samples taken from monitoring wells, two drainage tiles located along the perimeter of the sludge trenches, a catchment pond, and a nearby stream were analyzed for NO3(-)-N, NH4(+)-N, and Cl(-). Increases in Cl(-) concentrations were detected in shallow wells within the trench site perimeter 12 months after sludge entrenchment. Chloride levels peaked approximately 18 months after entrenchment and levels declined but not to background levels four years after entrenchment. Nitrate levels increased in shallow wells located within or near the trench site perimeter at 18 months after entrenchment and peaked at 30 months. Decreases in NO3(-)-N occurred thereafter but had not reached background levels in some wells. Ammonium increases also wer detected in wells recording Cl(-) and O3(-)-N increases, but NH4(+)-N increases were inconsistent. Increases in Cl(-) and NO3(-)-N levels were recorede for wells within the trench site perimeter. The data from this study indicated that contamination of groundwater by leachate from sludge trenches was within the trench site perimeter with a lesser degree of contamination recorded in wells below the trench site. The drainage tiles and clay barrier may have had a significant effect on the resulting groundwater data, and caution is advised in extrapolating these results to other locations. (Sims-ISWS)
W78-07110

REVIEW OF ENVIRONMENTAL ISSUES OF TRANSPORTATION OF ALASKAN NORTH SLOPE CRUDE OIL,
MITRE Corp., McLean, VA. METREK Div.
For primary bibliographic entry see Field 6G.
W78-07121

SURVEY OF ALTERNATIVES TO THE USE OF CHLORIDES FOR HIGHWAY DEICING,
Federal Highway Administration, Washington, DC. Materials Div.
For primary bibliographic entry see Field 4C.
W78-07122

MONITORING TO DETECT PREVIOUSLY UNRECOGNIZED POLLUTANTS IN SURFACE WATERS, (TEXT AND APPENDIX: ORGANIC ANALYSIS DATA),
Illinois Univ. at Urbana-Champaign. Inst. for Environmental Studies.
For primary bibliographic entry see Field 5A.
W78-07130

ENVIRONMENTAL MONITORING NEAR INDUSTRIAL SITES: SAMPLING AND ANALYSIS OF SELECTED TOXIC SUBSTANCES. TASK I - VINYLIDENE CHLORIDE,
Midwest Research Inst., Kansas City, MO.
For primary bibliographic entry see Field 5A.
W78-07132

ENVIRONMENTAL CHEMICALS: HUMAN AND ANIMAL HEALTH, AUGUST 7-11, 1972, FORT COLLINS, COLORADO.
Colorado State Univ., Fort Collins. Inst. of Rural Environmental Health

Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 648, Price codes: A11 in paper copy, A01 in microfiche. Report No. EPA-540/9-72-015, 1972. 246 p, 20 fig, 58 tab, 328 ref.

Descriptors: *Conferences, *Publications, *Chemicals, *Public health, Human pathology, Environment, Toxicity, Pesticides, Heavy metals, Polychlorinated biphenyls, Carbon monoxide, Air pollution, Water pollution, Toxins, Pollutant identification.

Twenty-six conference papers, presented at the first annual short course on environmental chemicals held at Colorado State University, Fort Collins, Colorado August 7-11, 1972, are compiled. Primarily, the issues are the relationships and interactions of chemicals in the environment and their effects on human and animal health. Topics include: (1) trace elements in water, (2) mercury as an environmental pollutant, (3) molybdenum as an environmental pollutant, (4) lead in soils and plants, (5) heavy metal poisoning in animals, (6) adverse health effects of trace materials in the environment, (7) environmental chemicals and carcinogenesis, (8) chemical interactions, (9) exposure measurement, (10) polychlorinated biphenyls (PCB's) in humans, (11) epidemiology of poisoning by chemicals, (12) monitoring of environmental toxicants, (13) the analytical laboratory, (14) PCB's in silage and human milk in rural Colorado, (15) interaction of PCB's and other organochlorines with duck hepatitis virus, (16) carbon monoxide as a national problem, (17) carbon monoxide poisonings at high altitudes, (18) the impact of environmental chemicals in water in the Rocky Mountain area, (19) nitrates and water quality, (20) air and human health, (21) teratogenesis and mutagenesis of environmental chemicals, (22) pesticides in air, (23) USDA-APHS environmental statement, (24) PCBs: an industrial pollutant, (25) epidemiology of animal poisonings other than heavy metal, and (26) environmental geochemistry in Missouir. (See W78-07135 thru W78-07141) (Seip-IPA)
W78-07134

TRACE ELEMENTS IN WATER,
Environmental Protection Agency, Denver, CO.
A. V. Soukup.
In: Environmental Chemicals: Human and Animal Health (Proceedings), August 7-11, 1972, Fort Collins, Colorado, Report No. EPA-540/9-72-015. p 11-21. 1972. 4 tab, 7 ref.

Descriptors: *Potable water, *Trace elements, *Public health, *Human pathology, Toxicity, Arsenic, Lead, Cadmium, Dyes, Pesticides, Pesticide residues, Human physiology.

A discussion of potential health hazards resulting from trace elements in drinking water treats sources, means of ingestion, hazards, and maximum allowable concentrations (MAC) for arsenic, lead, and cadmium. Arsenic is a highly toxic chemical; potential sources include industrial wastes which may be dumped directly into streams (from which arsenic may percolate into groundwater), geologic formations, and deliberate placement. Arsenic poisoning symptoms include languor, anorexia, nausea, diarrhea, jaundice, edema, conjunctival congestion and catarrhal inflammation of the upper respiratory tract. Arsenic MAC was set by the U.S. Public Health Service at 0.01 mg/l in drinking water. Cumulative lead poisoning is of three types: gastrointestinal, neuromuscular, and central nervous system. Water contamination may result from storage in tanks painted with oil-base paint or transport through lead pipes. Lead MAC has been set at 0.05 mg/l. Cadmium poisoning may result from use of insecticides and antihelminthics, metallurgical processes wastes, and ingestion of food and liquid prepared and left in cadmium-plated containers. Cadmium poisoning symptoms include cramps, nausea, vomiting and diarrhea; cadmium tends to concentrate and remain in the liver, kidneys, pancreas, and thyroid. Cadmium MAC is set at 0.01 mg/l in drinking water. Toxic levels of many potentially hazardous dyestuffs have not been set; hydrophilic, nonpolar, breakdown-resistant dyes are most likely to reach drinking water supplies. Pesticides reach ground, surface, and drinking water through direct application, percolation, runoff, and drift. Poisoning, symptoms, toxic levels and synergistic potential are species-specific. (See also W78-07134) (Seip-IPA)
W78-07135

MERCURY AS AN ENVIRONMENTAL POLLUTANT,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
M. G. Petit.
In: Environmental Chemicals: Human and Animal Health (Proceedings), August 7-11, 1972, Fort Collins, Colorado, Report No. EPA-540/9-72-015. p 23-27, 1972. 2 fig, 6 ref.

Descriptors: *Mercury, *Air pollution, *Caves, *Digestion, *Copper, *Mining, *Arizona, Analytical techniques, Food chains, Pollutant identification, *Bats, *Bat guano, *Pollution assessment.

A 16-year chronological record of mercury concentrations, found in guano deposits of the Mexican free-tailed bat (Tadarida brasiliensis), recovered from the dry cave in Eagle Creek Canyon, Greenlee County, Arizona, was kept in order to determine the extent of mercury pollution in the area. Annual mercury concentrations in the guano were compared to the annual copper production of a smelter located 5.5 airmiles from the bat cave at Eagle Creek. Copper production decreased in the years 1957, 1958, 1959, and 1967. Guano mercury concentrations reached a relative maximum in 1957, showed a large decrease in 1958 and 1959 and, in subsequent years, did not return to the high levels observed in 1957 until 1971; the decrease in concentration was particularly acute in 1968. The 1-year delay observed between the decrease in copper production and the decrease in mercury in the flood chain of the free-tailed bat implies an indirect route of entry into this mammal's food chain; this delay suggests that the mercury is taken up from the atmosphere either directly or from precipitation at a lower level on the food chain. It is hypothesized that moth larvae or the vegetation they feed on is the port of entry into the bat's food chain. Analysis of guano deposits in dry caves is a useful tool for assessing the effectiveness of cleanup or pollution abatement procedures, geological phenomena, and soil tillage (an earth surface-altering activity which may release mercury held in the earth's crust and upper mantle). (See also W78-07134) (Seip-IPA)
W78-07136

MOLYBDENUM AS AN ENVIRONMENTAL POLLUTANT,
Colorado State Univ., Fort Collins. Dept. of Animal Science.
G. M. Ward.
In: Environmental Chemicals: Human and Animal Health (Proceedings), August 7-11, 1972, Fort Collins, Colorado, Report No. EPA-540/9-72-015. p 29-31, 1972.

Descriptors: *Molybdenum, *Environmental effects, *Toxicity, *Toxins, *Mining, *Water pollution, *Potable water, Animal pathology, Colorado, Rocky Mountain region, Mining impacts.

A project, entitled 'An Interdisciplinary Study of the Transport and Biological Effect of Molybdenum in the Environment' investigated the sources, transport, and availability of molybdenum to man on the Eastern Slope of the Rocky Mountains in Colorado. The principal source of molybdenum in Colorado waterways is the Climax molybdenum mine. The drainage from this mine is through the Ten Mile Creek to Dillion Reservoir and ultimately to the South Platte River which flows through Denver; there it is tapped for urban water supply and into farming areas around Brighton and Platteville, where it furnishes irrigation water. Another source of molybdenum in Denver is Clear Creek, which drains the area of another mine near Empire. The relation between mining activity and the concentration of molybdenum is supported by data comparing molybdenum concentrations in water from various sources in Colorado and by the fact that streams draining an undisturbed area of known molybdenum deposits have normal molybdenum levels. Molybdenum poisoning is particularly severe in ruminating animals and is linked to a copper deficiency and an enzyme inactivation. A research plan is detailed in which flora and fauna, irrigation water, soil samples, milk, food chain and Dillion Reservoir biota were analyzed for molybdenum levels. Metabolic studies are underway to evaluate the effects of low level chronic intakes of molybdenum by rats. The chemical properties of molybdenum are also being investigated extensively. (See also W78-07134) (Seip-IPA)
W78-07137

LEAD IN SOILS AND PLANTS,
Colorado State Univ., Fort Collins. Dept. of Botany and Plant Pathology.
R. L. Zimdahl, and J. H. Arvik.
In: Environmental Chemicals: Human and Animal Health (Proceedings), August 7-11, 1972, Fort Collins, Colorado, Report No. EPA-540/9 72-015. p 33-40. 1972. 2 fig, 1 tab.

Descriptors: *Lead, *Vegetation, *Plant grouse, *Absorption, *Soil contamination, Analytical techniques, Pollutant identification, Environmental effects, *Automobile emissions, Lead uptake.

The transport of lead through soil and its uptake by and effect on plants was investigated in a research project entitled 'Impact on Man of Environmental Contamination Caused by Lead', now underway at Colorado State University. A truck-mounted hydraulic probe was used to sample the soil in 6-in vertical increments to a depth of 3 ft, and in horizontal increments to approximately 500 ft in order to determine the effects of lead in automobile exhaust emissions on lead uptake in soils. Results confirmed previous observations: lead content in soil decreases with increasing depth and distance from the highway. Factors such as wind and load conditions on the automobiles (affecting the amount of gasoline burned, and hence the emission and lead deposition rates) affect the areal distribution and depth of lead in soils. Studies of seven soil types indicate that the cation exchange capacity (CEC) is a primary determinant of the soil's ability to sorb lead; CEC is attentuated by pH to the degree that less lead is sorbed in soils of low pH, and hence may be more available to plants. Studies of lead uptake in plants indicate that uptake is directly related to lead concentration in solution. In general, lead remains concentrated in the root with limited translocation to the shoot. The ratio of the amount of lead in the root to that in the shoot decreased with increasing solution concentrations. Data indicate limited translocation under most conditions and limited root-capacity to bind and hold lead. The site of lead uptake by a plant is in the root rather than in the shoot. Foliar, stomatal, and cuticular penetration are currently under study, but data indicate that penetration is minimal for each type. Analytical procedures are detailed. (See also W78-05134) (Seip-IPA)
W78-07138

CHEMICALS IN THE WATERS OF THE ROCKY MOUNTAIN REGION,
Colorado State Univ., Fort Collins. Dept. of Zoology.
C. G. Wilber.
In: Environmental Chemicals: Human and Animal Health (Proceedings), August 7-11, 1972, Fort Collins, Colorado, Report No. EPA-540/9-72-015. p 135-149, 1972. 5 tab, 18 ref.

Descriptors: *Chemicals, *Chemical reactions, *Rocky Mountain Region, *Trace elements, *Aquatic environment, *Aquatic life, Diversion, Rivers, Streams, Copper, Zinc, Aluminum, Lead, Dissolved oxygen, Chromium, Mercury, Alterations of flow, *Synergism, Antagonism, *Trace metals, Aluminum salts.

A general overview of the chemical nature of Rocky Mountain natural water hydrology is presented with particular emphasis on trace metal levels, contamination, and impact. An assortment of chemicals in unusual concentrations in water can drastically modify the biology of a species without directly killing it. Synergism and antagonism are involved in the final overall biological action of the effluent. The synergistic interaction of zinc and copper and its effect on rainbow trout and Atlantic salmon is detailed. The streamflow of Rocky Mountain rivers is extremely variable and causes dramatically fluctuating chemical characteristics. Transmountain diversion of water is extremely common and significantly impacts the hydrology of the area; it is projected that future manipulations of rivers by man will stabilize the stream flow. The function in animal life and can act synergistically with other substances to increase toxicity. Results of water analyses for mercury, aluminum salts, lead, and dissolved oxygen are reported. Dissolved oxygen requirements are estimated and detailed. (See also W78-07134)
W78-07139

NITRATES: HUMAN AND ANIMAL HEALTH,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
J. Osteryoung.
In: Environmental Chemicals: Human and Animal Health (Proceedings), August 7-11, 1972, Fort Collins, Colorado. Report No. EPA-540/9-72-015. p 151-172, 1972. 2 fig, 5 tab, 79 ref.

Descriptors: *Nitrates, *Nitrogen compounds, *Nitrites, *Public health, *Potable water, Toxicity, Toxins, Foods, Standards, *Carcinogens, *Methemoglobinemia, Nitrosamines, Sudden death syndrome.

The hazards associated with ingestion of nitrates are reviewed. The nitrate content of foods (which occurs naturally and as a result of additives) and the mechanism of nitrate toxicity are detailed. Methemoglobinemia is a serious and often fatal result of nitrate exposure. Evidence indicates that some people are indirectly exposed to carcinogenic nitrosamines through nitrate and nitrite exposure. Chronic effects of nitrate exposure are unknown but may include hypertension and atherosclerotic disease. There is some possibility of involvement of nitrate exposure with sudden death in infants and adults. Drinking water standards have been set at 45 mg/l nitrate (10 mg/l nitrogen) by the U.S. Public Health Service; significant evidence exists that such a level is too high, particularly for infant consumption. Toxic levels are highly dependent on individual variation (in body weight, consumption, and age) and climate. Epidemological and physiological studies are imperative, as are public education programs and revision of maximum allowable concentration. (See also W78-07134) (Seip-IPA)
W78-07140

POLYCHLORINATED BIPHENYLS: AN INDUSTRIAL POLLUTANT,
Colorado State Univ., Fort Collins. Dept. of Entomology.
R. E. Johnsen.
In: Environmental Chemicals: Human and Animal Health (Proceedings), August 7-11, 1972, Fort Collins, Colorado. Report No. EPA-540/9-72-015. p 213-220, 1972. 4 fig, 4 tab, 2 ref.

Descriptors: *Polychlorinated biphenyls, *Chemical properties, *Environmental effects, *Pollutant identification, DDT, Industrial wastes, Industrial production.

The widespread use of polychlorinated biphenyls (PCB's) in industrial processes has resulted in a severe environmental pollution problem. PCB's manufactured by the direct chlorination of biphenyls exist in about 100 forms, depending on the degree of chlorination and the position of chlorine on the rings. Recent advances in analytical instrumentation have facilitated the positive identification of PCB's in the environment; the environment incidence of PCB's worldwide indicated that they are most abundant in industrialized nations. In the U.S., PCB's have been found in human hair and adipose tissues, bald eagles, sewerage, birds, fish, human milk, and river and stream water. The physical properties which insure the environmental persistence of PCB's incude: (1) low vapor pressure and water solubility, (2) high boiling point, lipid solubility, dielectric constant, and thermal stability; (3) high resistance to acids, alkalies, and corrosive chemicals; and (4) high resistance to oxidation and environmental breakdown. Because of their chemical structure, PCB's are considerably more resistant to breakdown than is DDT. Possible routes of PCB's into the environment include: (1) incineration of waste materials; (2) accidental leaks of equipment such as heat transfer systems; (3) weathering or friction-wearing of the action with food products in their uses as an ingredient in substances such as plastics and paint. PCB's are readily absorbed into the root systems of certain plants. (See also W78-07134) (Seip-IPA)
W78-07141

ECOLOGICAL CARRYING CAPACITY RESEARCH: YOSEMITE NATIONAL PARK. PART IV. SEASONAL AND GEOGRAPHICAL DISTRIBUTION OF INDICATOR BACTERIA IN SUBALPINE AND ALPINE WATERS,
California Univ., Berkeley. Dept. of Plant Pathology.
J. E. Holmes.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 958. Price codes: A08 in paper copy, A01 in microfiche. Report No. NPS - YOSE-WR-004, September 8, 1976. 162 p, 66 fig, 33 ref. CX 8000-4-0026.

Descriptors: *Coliforms, *Enteric bacteria, *Sewage bacteria, *Aquatic bacteria, *Pollutant identification, *Fluctuations, *Seasonal, *Microenvironment, Lakes, Streams, Groundwater, Snowmelt, California, National Parks, *Yosemite National Park, *Fecal coliforms, *Fecal streptococci, *Subalpine ecology, Flushing.

Research in the vicinity of Tuolumne meadows, Nelson and Matthes Lakes in Yosemite National Park, was undertaken in 1974 to assess the nature and extent of user damage (impact) to the ecology of this subalpine area. Limnological data indicated thorough annual flushing by snowmelt and little opportunity for accumulation of introduced nutrients and associated eutrophication. Limited testing for total coliform bacteria led to a greatly expanded study (summer 1975) of total coliform, fecal coliform, and fecal streptococci indicator bacteria in 12 watersheds of the Yosemite wilderness. Typical waters ranged from virtual sterility in early July snowmelt, to light and moderate levels in August and September samples, to heavy levels in storm runoff. Little correlation of human use with increased indicator levels was shown, due either to masking by background levels of indicators from the native warm-blooded species or to lack of markedly substantial human bacterial inputs to surface and ground waters. There was a strong indication that lake waters are safer sources of drinking water than streams, except along heavily used lakeshores. (Seip-IPA)
W78-07142

ANAEROBIC MICROBIAL COMMUNITY METABOLISM IN SPARTINA ALTERNIFLORA SOILS,
Georgia Univ., Athens. Dept. of Microbiology.
For primary bibliographic entry see Field 2G.
W78-07156

THE DECOMPOSITION OF STANDING AND FALLEN LITTER OF TYPHA GLAUCA AND SCIRPUS FLUVIATILIS,
Iowa State Univ., Ames. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 5C.
W78-07162

AN UNUSUAL PUMP TEST NEAR ESTERHAZY, SASKATCHEWAN,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 5G.
W78-07172

WATER QUALITY INTERPRETIVE REPORT, PRINCE EDWARD ISLAND, 1961 - 1973,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 5A.
W78-07176

CRANKCASE OILS: ARE THEY A MAJOR MUTAGENIC BURDEN IN THE AQUATIC ENVIRONMENT,
Fisheries and Marine Service, St. John's (Newfoundland). Biological Station.
J. F. Payne, L. Martins, and A. Rahimtula.
Science, Vol 200, No 4339, April 21, 1978, p 329-330, 1 tab, 26 ref.

Descriptors: Environmental effects, *Water pollution, *Oil, Genetics, Fish genetics, Aquatic habitats, Aquatic environment, *Oil pollution, *Mutagenesis, Crankcase oil.

This study showed that fish can produce mutagenic metabolities from polycyclic aromatic hydrocarbons (PAH) and that used crankcase oils released to the aquatic and terrestrial environment may represent a considerable mutagenic threat. Benzopyrene and benzanthracene, which are produced in automobile engines, did not appear to be the major mutagenic components. Fish taken from environmental sites with a history of oil contamination have been shown to have elevated aromatic hydrocarbon hydrolases (AHH) levels. In some mammalian systems there has been seen a relationship between AHH activity and susceptibility to hydrocarbon-induced cancers. It is suggested that the public health hazard of crankcase oil should be reassessed. (Chilton-ORNL)
W78-07190

THE FATE OF CHLORINE IN SEA-WATER,
Woods Hole Oceanographic Inst., MA. Dept. of Chemistry.
G. T. F. Wong, and J. A. Davidson.
Water Research, Vol 11, No 11, 1977, p 971-978, 8 fig, 2 tab, 30 ref.

Descriptors: Water pollution, *Water pollution sources, Pollutants, Chlorine, *Sea water, Chemistry, Chemical reactions, *Path of pollutants.

In order to assess the full environmental impact of the chlorination of sea-water, it is necessary to understand the complex and competing reactions which take place in salt water systems. The term chlorine demand applied to sea water describes a variety of chemical reactions which all lead to the disappearance of titratable free or combined chlorine. It was concluded that measurements of chlorine demand in toxicity analyses of marine waters has limited usefulness because it does not provide any insight into the actual fate of chlorine added. Hypochlorite undergoes a rapid (2.5 min exchange reaction with bromide to form hypobromite which is unstable in seawater. The

products of the decomposition of hypobromite are not yet identified. There appears to be no limit to the capability of seawater to consume hypohalite indicating that the reaction is either an auto-decomposition or that the reactant which consumes hypohalite must be abundant in seawater. (Chilton-ORNL)
W78-07193

5C. Effects Of Pollution

THE ENVIRONMENT OF AMCHITKA ISLAND, ALASKA.
Department of Energy, Washington, DC. Div. of Military Application.
For primary bibliographic entry see Field 6G.
W78-06702

WEST ANTARCTIC ICE SHEET AND CO2 GREENHOUSE EFFECT: A THREAT OF DISASTER,
Ohio State Univ. Research Foundation, Columbus. Inst. of Polar Studies.
For primary bibliographic entry see Field 5B.
W78-06721

HIGHWAY OPERATION AND PLANT DAMAGE,
California State Dept. of Transportation, Sacramento. Transportation Lab.
For primary bibliographic entry see Field 5B.
W78-06725

ACCUMULATION OF WATER SOLUBLE PHOSPHORUS AND HYDROLYSIS OF POLYPHOSPHATES BY CLADOPHERA GLOMERATA (CHLOROPHYCEAE),
Wisconsin Univ., Milwaukee. Dept. of Botany.
C. K. Lin.
Journal of Phycology, Vol. 13, No. 1, March 1977, p. 46-51. 5 fig, 2 tab, 48 ref. OWRT A-041-WIS(2).

Descriptors: *Cladophora, *Phosphorus, *Hydrolysis, *Enzymes, *Hydrogen ion concentration, Chlorophyta, Phosphorus compounds, Catalysts, Light intensity, Magnesium, Lake Michigan, Great Lakes, Cladophora glomerata(L.) Kutz.

In a study of phosphorus accumulation by the aquatic algae Cladophora glomerata (L.) Kutz in relation to external nutrient supply and to hydrolysis of polyphosphates, it was found that concentrations of hot-water extractable phosphorus from most samples were relatively high (0.06-0.68%) and correlated closely with the amount of total dissolved phosphorus in the ambient Lake Michigan water. The massive growth of this green algae in the lower Great Lakes is related to phosphorus input from point source pollution stemming from waste water discharge, involving pyrophosphate and tripolyphosphate which have been commonly used as detergent builders. Using samples collected along the Lake Michigan shore near the Milwaukee River and the municipal sewage discharge into Milwaukee harbor, measurements were made for extractable phosphate and intracellular, extracellular and cell wall forms of phosphatases. Cladophora was able to hydrolyze polyophosphate by enzymes found in the three types of cell fractions. Intracellular phosphatase activity is pH dependent with the optimal hydrolysis rate at pH 7.8. Phosphatase secretion is affected by pH, with the maximum rate at 7 but affected little by light intensity. Magnesium is the most important effective metallic cofactor required for maximal rates of intracellular phosphatase activities. (See also W72-13644) (Harris-Wisconsin)
W78-06747

SHELL GROWTH OF UNFED OYSTERS IN THE LABORATORY: A SUBLETHAL BIOASSAY SYSTEM FOR POLLUTANTS,
Maryland Univ., College Park. Dept. of Chemistry.
K. A. Conger, M. L. Swift, J. B. Reeves, III, and S. Lakshmanan.
Life Sciences, Vol. 22, No. 3, January 1978, p 245-254, 5 fig, 3 tab, 12 ref. OWRT B-012-MD(2), 14-31-0001-3669.

Descriptors: Environmental effects, *Water pollution effects, *Bioassay, Oysters, Calcium, Toxicity, Pollutant identification, Sublethal bioassay.

Unfed oysters were maintained in tanks at 17C and a salinity of 12 g/l. When the tanks were supplemented with calcium ion concentrations of 1.5 mM was determined. Oysters subjected to an initial concentration of 0.25 mg/l cadmium to oysters is well known and this experiment was done to delineate the responsiveness of the assay system to a general metabolic inhibitor. (Chilton-ORNL)
W78-06750

COMBINED EFFECT OF THERMAL AND ORGANIC POLLUTION ON OXYGEN SAG CURVE - PHASE II,
Worcester Polytechnic Inst., MA.
K. Keshavan, and G. C. Sornberger.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 034, Price codes: A05 in paper copy, A01 in microfiche. Completion Report, (1978). 89 p. OWRT C-4067 (No 9014)(1).

Descriptors: *Water pollution effects, *Organic wastes, *Dissolved oxygen, *Oxygen sag curve, *Thermal pollution, *Thermal overload, Deoxygenation coefficient, Reaeration coefficient, Optimal location, Critical oxygen concentration, Saturation oxygen concentration, Temperature gradient, Plug flow model, Longitudinal dispersion, Variable temperature, *Estuarine dynamics, *Monte Carlo simulation, Stochastic model, Oxygen demand, Biochemical oxygen demand.

In Part I a hydraulic model was used to obtain the longitudinal dispersion coefficient to be used in a set of three differential equations to obtain the Oxygen Sag Curve. The three differential equations could not be solved in this research because of the extreme complexity faced as a result of variable coefficients. In Part II a Monte Carlo computer simulation of the estuarine dynamics of BOD motion and decomposition was developed subject to the effects of longitudinal dispersion, fresh water flow, cyclic tidal flow, and thermal overload. Sample travel patterns and BOD decomposition profiles were obtained under varying sets of initial conditions with the results displayed both graphically and in tabular form. The interpretation of the underlying stochastic model and the Monte Carlo simulated travel patterns is discussed and the applicability of the method to water quality management is indicated. (See also W73-11423)
W78-06751

WATER QUALITY ASSESSMENT FOR THE KANAWHA RIVER BASIN (NORTH CAROLINA, VIRGINIA, WEST VIRGINIA),
Environmental Protection Agency, Wheeling, WV. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5G.
W78-06778

BENCHMARK ESTABLISHMENT AND WATER QUALITY MONITORING IN THE BRIDGEPORT AND BLACK ROCK HARBOR SYSTEMS,
Higher Education Center for Urban Studies, Bridgeport, CT.
For primary bibliographic entry see Field 5A.
W78-06787

STUDY OF THE CONDITIONS OF POLIOMYELITIS VIRUS AND ESCHERICHIA COLI BACTERIOPHAGE CONCENTRATION ON ION-EXCHANGE RESINS (IN RUSSIAN),
Institute of General and Municipal Hygiene, Moscow (USSR).
N. K. Lepakhina.
Gig Sanit 2, p 56-59, 1977.

Descriptors: *Poliomyelitis virus, *Viruses, *E coli, *Bacteraphages, *Ion exchange resins, Enteriioviruses, Picornavirus, Water pollution.

A comparative study of a number of Soviet ion-exchange resins was conducted to determine their suitability for the isolation of enteroviruses (poliomyeltis virus) and coli phages in water bodies and in drinking water. Resins AV-17-IK and An31G proved most effective. Optimal conditions for concentrating the viruses were determined.--Copyright 1978, Biological Abstracts, Inc.
W78-06816

SUBLETHAL EFFECTS OF THE WATER-SOLUBLE FRACTION OF NIGERIAN CRUDE OIL ON THE JUVENILE HARD CLAMS, MERCENARIA MERCENARIA (LINNE),
Delaware Univ., Lewes. Marine Studies Complex.
R. T. Keck, R. C. Heess, J. Wehmiller, and D. Maurer.
Environmental Pollution, Vol 15, No 2, p 109-119, February 1978. 5 fig, 2 tab, 30 ref.

Descriptors: *Oil pollution, *Clams, *Water pollution effects, Resources development, Environmental effects, Mortalities, Outer Continental Shelf, Crude oil, Mercenaria mercenaria, Hydrocarbons, Nigerian crude oil, Sublethal effects, Petroleum.

Juvenile hard clams, Mercenaria mercenaria (Linne), were exposed to the water-soluble fraction (WSF) of Nigerian crude oil at cncentrations ranging from 7 ppm to 0.06 ppm. During the six-week experimental period the feeding rates of the clams exposed to hydrocarbons were significantly lower than those of the controls. The growth rates of control clams were three times greater than the growth rates of the experimental groups. Mortalities were low during the entire experimental period; however, during a two-week depuration period all clams in the most polluted conditions (7 ppm) died. (Sinha - OEIS)
W78-06831

RESISTANCE OF DETRITOPHAGES OF BIOFILTERS IN PHENOL POISONING (IN RUSSIAN),
Research Inst. of Chemical Technology and Polymer, Dzerzhinsk (USSR).
O. G. Bobrov, and V. V. Sudakova.
Gidrobiol Zh 13(1), p 71-74, 1977.

Descriptors: *Detritophages, *Bacteriophages, Biofilters, *Phenols, Lethal limit, Toxicity, Caloglyphus-sphaerogaster, Histiogaster-sp, Psychoda-alternata.

Resistance (MTC (maximum tolerable concentration), CL50 and CL100) of Psychoda alternata (Say.) and Histiogaster sp. and Caloglyphus sphaerogaster Zachv. larvae was determined in aqueous solutions of salicylic and carboxlic acids (acute experiments). This established index depended mainly on the morphophysiological peculiarities of the organisms. Discussed is the possibility of using the highly toxic phenolic waste of salicylic acid production for mite and insect control to render sediments of biological purification plants harmless.--Copyright 1978, Biological Abstracts, Inc.
W78-06833

BIOAVAILABILITY OF NAPHTHALENES FROM MARINE SEDIMENTS ARTIFICIALLY

CONTAMINATED WITH PRUDHOE BAY CRUDE OIL,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Labs.
G. Roesijadi, D. L. Woodruff, and J. W. Anderson.
Environmental Pollution, Vol 15, No 3, p 223-229, March 1978. 2 tab, 17 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Sediments, *Clams, *Absorption, Outer Continental Shelf, *Bioavailability, Marine sediments, Prudhoe Bay crude oil, Crude oil, Naphthalenes, Macoma inquinata.

Uptake of naphthalenes from sand and detritus contaminated with Prudhoe Bay crude oil was examined in the detritivorous clam Macoma inquinata. Concentrations of naphthalenes were determined by ultraviolet spectrophotometry and the use of radiolabelled 14C-2-methylnaphthalene. Exposure of M. inquinata to contaminated sediments indicated that uptake of naphthalenes which were released from sediment to the surrounding water were available from uptake by the clams. Results were consistent with the results of other studies which examined bioavailability of naphthalenes from oil-contaminated sediment. (Sinha - OEIS)
W78-06834

EFFECTS OF CRUDE OILS AND THE OIL DISPERSANT COREXIT ON PRIMARY PRODUCTION OF ARCTIC MARINE PHYTOPLANKTON AND SEAWEED,
Fisheries and Marine Service, Ste Anne de Bellevue (Quebec). Arctic Biological Station.
S. I. C. Hsiao, D. W. Kittle, and M. G. Foy.
Environmental Pollution, Vol 15, No 3, p 209-221, March 1978. 7 fig, 4 tab, 21 ref.

Descriptors: *Oil pollution, *Phytoplankton, *Arctic, *Toxicity, *Water pollution effects, Oil spills, Algae, Outer Continental Shelf, *Dispersants, *Corexit, Laminaria, Seaweeds.

Effects of crude oil and Corexit on primary production of arctic marine phytoplankton were studied in situ. The production rate varied with types and concentrations of crude oil, method of preparation of oil-seawater mixtures, environmental conditions and species composition of each sample tested. In samples with the same species composition, inhibition of production generally increased ith increasing oil concentration. The crude oil-Corexit mixtures were more toxic than crude oil or Corexit alone. In situ primary production of the seaweeds, Laminaria saccharina (L.) Lamouroux and Phyllophora truncata (P.) Newroth et Taylor was significantly inhibited by all types and concentrations of oil tested. (Sinha - OEIS)
W78-06835

THE BIOLOGICAL EFFECTS OF THE WATER-SOLUBLE FRACTIONS OF A NO. 2 FUEL OIL ON THE PLANKTONIC SHRIMP, LUCIFER FAXONI,
Texas Univ. at Austin, Port Aransas. Marine Science Inst.
W. Y. Lee, K. Winters, and J. A. C. Nicol.
Environmental Pollution, Vol 15, No 3, p 167-183, March 1978. 3 fig, 8 tab, 40 ref.

Descriptors: *Water pollution effects, *Oil pollution, *Plankton, *Shrimp, Aromatic compounds, Resources development, Outer Continental Shelf, Lucifer faxoni, Hydrocarbons, Fuel oil.

The biological effects of water-soluble fractions (WSFs) of a No. 2 fuel (heating) oil on the planktonic shrimp, Lucifer faxoni, were investigated. Biological parameters used to assess toxicity were survival, respiration, feeding rate and degree of activity. The biological and chemical data appear to indicate that the higher toxicity of fresh WSF to L. faxoni was due to volatile aromatic hydrocarbons. It seems that the toxicity of oil spills could be markedly less than some laboratory results suggest because there is reduced toxicity following weathering by evaporation. Respiration rates of L. faxoni during an 8 hr. exposure to freshly prepared WSF rose with increasing concentrations up to 30% of WSF, then fell further increases of concentration of WSF. (Sinha - OEIS)
W78-06836

TOXICOLOGY OF POLYETHYLENEPOLYAMINE AND SUBSTANTIATION OF ITS MAXIMUM PERMISSIBLE CONCENTRATION IN BODIES OF WATER (IN RUSSIAN),
V. I. Antonova, Z. A. Salmina, and T. V. Vinokurova.
Gig Sanit (2), p 32-35, 1977.

Descriptors: *Toxicology, *Polyethylenepolyamine, Amines, Lethal limit, Pollutant identification, Water quality standards, Mice, Rats, *Organoleptic indices.

The effect of polyethylenepolyamine on the organoleptic indices of water, the sanitary regimen of water bodies and the body of warm-blooded animals (rats, mice) under conditions of acute, subacute and chronic action were studied. The data obtained allowed the substantiation and recommendation of the maximum permissible concentration of polyethylenepolyamine to be 0.005 mg/l in bodies of water.--Copyright 1978, Biological Abstracts, Inc.
W78-06837

ON THE QUESTION OF O2 REQUIREMENT IN DETERMINING ACUTE TOXICITY IN FISH (IN GERMAN),
Bundesgesundheitsamt, Berlin (West Germany). Inst. fuer Wasser-, Boden- und Lufthygiene.
P. Sobhani, and F. Herzel.
Z Angew Zool 63(1), p 111-114, 1976.

Descriptors: *Oxygen requirements, *Toxicity, Water pollution effects, Pollutant identification, *Chub, Leucisus-idus.

The O2 content in test squaria is an important criterion for the determination of toxicity for fish. Since continuous aeration had an unfavorable effect upon a number of chemical tested, the dynamics of O2 concentration resulting from the keeping of test animals (chub, Leuciscus idus) in non-aerated aquaria over a number of days were measured.--Copyright 1978, Biological Abstracts, Inc.
W78-06838

POLYAROMATIC HYDROCARBONS IN OYSTER FROM COASTAL LAGOONS ALONG THE EASTERN COAST OF THE GULF OF MEXICO, MEXICO,
Universidad Nacional Autonoma de Mexico, Mexico City. Inst. de Geofisica; and Universidad Nacional Autonoma de Mexico, Mexico City. Centro de Ciencias del Mar y Limnologia.
H. A. Bravo, S. L. Salazar, A. V. Botello, and E. F. Mandelli.
Bulletin of Environmental Contamination and Toxicology, Vol 19, No 2, p 171-176, February 1978. 2 fig, 1 tab, 11 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Gulf of Mexico, Mollusks, Resources development, Outer Continental Shelf, Natural sources, Benzene, Polyaromatic hydrocarbons.

Polynuclear aromatic hydrocarbons (PAHs) appear to be widely distributed in the sea, as well as in river water and soil. The presence of these compounds in aquatic organisms has been mainly attributed to oil spills, but biosynthesis, aerial transport, and terrestrial contributions are also important sources. The assessment of PAHs levels in marine bivalve mollusks has attracted great interest, since they are useful in determining the status of coastal areas with regard to petroleum contamination. The total concentrations of the PAHs in the analyzed samples are surprisingly high for oyster tissues. No single causative factor will adequately explain environmental data of this kind because the possibility of accidental spillages and intermittent activities that may contribute to the distortion of these results and provide a basis for further investigation. (Sinha-OEIS)
W78-06840

THE EFFECTS OF THE WATER-SOLUBLE FRACTIONS OF NO. 2 FUEL OIL ON THE EARLY DEVELOPMENT OF THE ESTUARINE FISH, FUNDULUS GRANDIS BAIRD AND GIRARD,
Texas A and M Univ., College Station. Dept. of Biology; and Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Labs.
V. Ernst, J. M. Neff, and J. W. Anderson.
Environmental Pollution, Vol 14, No 1, p 25-35, September 1977. 7 fig, 2 tab, 14 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Embryonic growth stage, Estuarine fisheries, Resources development, Outer Continental Shelf, Fundulus grandis, Fuel oil, Petroleum, Hydrocarbons.

Embryos of Fundulus grandis were exposed continuously to 12.5, 25 and 50% dilutions of the water-soluble fraction (WSF) of No. 2 fuel oil, corresponding to aqueous petroleum hydrocarbon concentrations of 1.1, 2.2 and 4.4 ppm, respectively, and aqueous naphthalenes concentrations of 0.56, 1.07 and 1.26 ppm, respectively. At different times during development, embryos were examined histologically and compared wit unexposed controls. Embryos exposed to 12.5% WSF generally hatched earlier than the controls and most were normal. Some of those exposed to 25% WSF has pathological liver, kidney, lens and epithelial tissues while others appeared normal. None of the embryos exposed to 50% WSF hatched and all had pathological tissues. (Sinha-OEIS)
W78-06841

DISTRIBUTION OF N-PARAFFINS IN SEAGRASSES, BENTHIC ALGAE, OYSTERS AND RECENT SEDIMENTS FROM TERMINOS LAGOON, CAMPECHE, MEXICO,
Universidad Nacional Autonoma de Mexico, Mexico City. Centro de Ciencias del Mar y Limnologia.
For primary bibliographic entry see Field 5B.
W78-06842

ENVIRONMENTAL RISK OF BEAUFORT SEA OIL SPILLS--A MANAGEMENT TOOL,
Coast Guard Research and Development Center, Groton, CT.
For primary bibliographic entry see Field 5G.
W78-06844

DISTRIBUTION OF TAR BALLS ON BAHAMIAN BEACHES,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W78-06845

BIOLOGICAL EFFECTS OF OIL ON EARLY DEVELOPMENT OF THE BALTIC HERRING CLUPEA HARENGUS MEMBRAS,
Swedish Water and Air Pollution Research Lab. Nykoping. Baltic Sea Lab.
O. Linden.
Marine Biology, Vol 45, No 3, p 273-283, 1978. 6 fig, 3 tab, 27 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Oil spills, *Herrings, Fish egg, *Outer Continental Shelf, *Baltic Sea, Clupea harengus membras, Crude oil, Fuel oil.

The effects of petroleum hydrocarbons from two crude oils and one fuel oil (no. 1) were studied on the ontogenic development of the Baltic herring, Clupea harengus membras L. The results are discussed in relation to the potential effects of oil spills and chronic oil pollution on fish eggs and larvae in the Baltic Sea. (Sinha - OEIS)
W78-06847

HYDROCARBONS IN THE MARINE ENVIRONMENT. II. DISTRIBUTION OF N-ALKANES IN THE FAUNA AND ENVIRONMENT OF THE SUB-ANTARCTIC ISLAND OF SOUTH GEORGIA,
Torry Research Station, Aberdeen (Scotland); and British Antarctic Survey, Cambridge (England).
For primary bibliographic entry see Field 5B.
W78-06849

ACCUMULATION AND ELIMINATION OF DIELDRIN IN MUSCLE TISSUE OF CHANNEL CATFISH,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 5B.
W78-06853

THE RELATIONSHIP BETWEEN LIGHT AND PHOTOSYNTHETIC RATE IN A RIVER COMMUNITY AND IMPLICATIONS FOR WATER QUALITY MODELING,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
G. M. Hornberger, M. G. Kelly, and R. M. Eller.
Water Resources Research, Vol. 12, No. 4, p 723-730, August 1976. 7 fig, 1 tab, 31 ref. OWRT C-5333(No. 4231)(3).

Descriptors: *Photosynthesis, Aquatic environment, Aquatic habitats, Nutrients, Inhibition, *Model studies, Water quality, *Light, *Productivity, *Virginia, *Mechum River(Va), *Water quality modeling.

Saturation of photosynthesis at naturally occurring high light intensities has widely been reported for aquatic communities. Contrary to this, using free water measurement methods, we found a relationship between light intensity and photosynthesis in a small river that was unmistakably linear on cloudless days and on days when points corresponding to times of highly variable radiaton were discarded. The linear relationship obtained through the year. Simulations of nutrient-limited growth in light-dark bottles show that nutrientf depletion effects can explain the cases of light saturation and inhibition previously reported in the literature. If light saturation and inhibition of photosynthesis are due even in part to artificially induced nutrient limitation, then the inclusion of nonlinear light terms in water quality models is inappropriate. (Skogerboe-Colorado State)
W78-06854

EFFECTS ON THE DELAWARE RIVER ESTUARY OF THE CORINTHOS OIL SPILL AT MARCUS HOOK ON JANUARY 31, 1975,
Rutgers - The State Univ., new Brunswick, NJ. Water Resources Research Inst.
R. C. Ahlert, W. Clement, and H. H. Haskin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 734, Price codes: A02 in paper copy, A01 in microfiche. Staff Report, 'Petroleum Industry in the Delaware Estuary'. National Science Foundation Report No. NSF-RA-E-75-193, December 1975. 17 p, 2 fig, 3 tab, Grant No. G42282.

Descriptors: *Oil spills, *Oil pollution, *Water pollution effects, Estuaries, Fish, Toxicity, *Outer Continental Shelf, Corinthos Oil spill, Tanker ships, Crude oil, *Delaware River Estuary.

The data collected subsequent to the Corinthos oil spill on January 31, 1975 did not indicate any 96 hour fish toxicity in the waters adjacent to and influenced by the spill either immediately after the spill or 60 hours after the spill. There is some indication that the spill increased the hydrocarbon contents of the water immediately after and adjacent to the spill, but subsequent analysis did not reveal any picture of waters containing high hydrocarbon levels proceeding down the estuary. No effect was observed when the phenol analyses are considered. A few relatively high values are susceptible to differing interpretations. Thus, whatever effects there were seem mainly to be concentrated in the vicinity of the spill and analytically disappear rapidly thereafter. (Sinha-OEIS)
W78-06857

THE METULA OIL SPILL,
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Lab.
For primary bibliographic entry see Field 5B.
W78-06862

COMBINED TOXICITY EFFECTS OF CHLORINE, AMMONIA, AND TEMPERATURE ON MARINE PLANKTON,
Woods Hole Oceanographic Inst., MA.
J. C. Goldman, and J. H. Ryther.
Available from the National Technical Information Service, Springfield, VA 22161 as COO-2532-2, Price codes: A04 in paper copy, A01 in microfiche. Woods Hole Oceanographic Institution Progress Report for Period Sept 16, 1975 - Sept 30, 1976 for the U.S. Energy Research and Development Administration, Oct 1976. 57 p, 11 fig, 9 tab, 51 ref. ERDA-E(11-1)-2532.

Descriptors: *Pollutant identification, *Chlorine, *Ammonia, *Temperature, *Water pollution effects, *Environmental effects, Plankton, Fish, Shellfish, Bioassay, Outer Continental Shelf.

Research on the combined effects of chlorine, ammonia and temperature on marine plankton have been carried out for 20 months. To date continuous-flow bioassays have been conducted on lobster larvae, oyster larvae, copepods, rotifers, three juvenile and larval fish, killifish, scup, and winter flounder, and phytoplankton. In addition, studies on zooplankton metabolism, filtration rates and growth were carried out on exposed organisms. In general, the responses of invertebrates were distinctly different than those of fish: increasing mortality with increasing chlorine dose and greater sensitivity of chloramines than free chlorine in the former, and a threshold level of chlorine and greater sensitivity to free chlorine in the latter. Phytoplankton responses indicate that chlorine effects on primary producers are minimal compared to the serious effects on zooplankton, particularly larval forms that spawn intermittently. The chemistry of chlorine is exceedingly complex. Bromine compounds are formed upon chlorination of seawater and the disappearance of added chlorine is rapid and occurs in two phases: an organic demand and chemical decomposition of the halites. The overall conclusions is that chlorine application at power plants must be carried out with extreme caution and that serious consideration should be given to applying dechlorination at all coastal cooling systems. (Sinha-OEIS)
W78-06863

POTENTIAL MARICULTURE YIELD OF FLOATING SEA THERMAL POWER PLANTS. PART I--GENERAL STATEMENT,
Lamont-Doherty Geological Observatory, Palisades, NY.; and City Univ. of New York. Inst. of Marine and Atmospheric Science.
O. A. Roels, S. Laurence, L. Van Hemelrijck, and A. F. Amos.
Available from the National Technical Information Service, Springfield, VA 22161 as CONF-751235-2, Price codes: A02 in paper copy, A01 in microfiche. Presented at Fall Meeting of American Geophysical Union, held in San Francisco, CA, Dec 8-12, 1975, and at Conference 'Energy from the Oceans--Fact or Fantasy', Held Raleigh, NC on Jan 27-28, 1976. 21 p, 2 fig, 4 tab, 3 ref. ERDA-E(11-1) 2581.

Descriptors: *Aquaculture, *Thermal pollution, *Thermal powerplants, Water resources, Resources development, Environmental effects, Outer Continental Shelf, Ocean thermal energy, *Mariculture, *Floating power plants.

Mariculture is not only compatible with electrical power production in sea-thermal power plants, but it is a highly desirable and economically sensible approach to the energy and food situation currently facing the world. The technical feasibility of maintaining the proper mixing of deep and surface water, and keeping this mixed layer at an optimum depth within the euphotic zone, remains to be demonstrated, as does a simple and inexpensive means of growing and harvesting shellfish in the open sea. Increasing cooperation between the power engineers, economists and mariculturists interested in OTEC plants is obviously needed. No sea-thermal power plant design which excludes the possibility of mariculture should be adopted until the relative contribution of the energy-production and biological potential of OTEC plants is examined carefully and in detail. (Sinha-OEIS)
W78-06864

COPPER IN THE SEA - A BIBLIOGRAPHY,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Lab.
R. L. Schmidt.
Available from the National Technical Information Service, Springfield, VA 22161 as BNWL-2206, Price codes: A03 in paper copy, A01 in microfiche. Battelle Pacific Northwest Laboratory Report No BNWL-2206 to the U.S. Energy Research and Development Administration, April 1977. 45 p, 784 ref. EY-76-C-06-1830.

Descriptors: *Copper, *Toxicity, Water pollution sources, *Bibliographies, *Outer Continental Shelf.

Copper has a toxic potential exceeding all other metals due to the quantity discharged and its toxicological effect. Fortunately, copper in the oceans is rendered less bioavailable or less toxic by its ready interaction with the complex chemical components of seawater. This bibliography was prepared to illustrate the status of current knowledge of the biogeochemistry of copper and to aid the development of research programs to define the effects of copper discharged to the marine environment. The references are categorized to aid the reader to locate literature concerning specific aspects of the biogeochemistry of copper. A brief comment describing the important findings in each category is given. Although this bibliography is not exhaustive, the listed references are likely representative of current knowledge. (Sinha-OEIS)
W78-06865

A CASE OF POISONING BY AMMONIUM SULFATE IN DRINKING WATER (IN RUSSIAN),
Ministerstvo Zdravookhraneniya SSSR, Moscow.
G. G. Okropiridze.
Gig Sanit 2, p 100, 1977.

Descriptors: *Potable water, *Ammonium sulfate, Sulfates, Public health, *Fertilizers, *Gastrointestinal dysfunction, Human poisoning, Intestinal diseases.

Gastrointestinal dysfunction giving symptoms similar to acute dysentery was observed in a group of 18 people who drank water containing 1500-2000 mg/l ammonium sulfate. The water was drunk from a faucet located next to vegetable hothouse where the ammonium sulfate was used as fertilizer. All of those affected were in satisfactory con-

dition after 24 h. Copyright 1978, Biological Abstracts, Inc.
W78-06866

COPPER.
National Research Council, Washington, DC. Committee on Medical and Biologic Effects of Environmental Pollutants.
For primary bibliographic entry see Field 5B.
W78-06872

SALT REGIME OF RESERVOIRS, CHAPTER 6: ELEMENTARY HYDROBIOLOGICAL PROGNOSIS,
Ya. F. Pleshkov.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 453, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 612, March 1977. 6 p, 1 tab. Translated from Gidrokhimicheskiye Materialy, Vol. 19, p 99-102, 1951.

Descriptors: *Reservoirs, *Hydrobiology, *Salts, Phytoplankton, Zooplankton, Trophic level, Nutrients, Eutrophication, Mesotrophy, Oligotrophy, Nitrates, Nitrites, Phosphates, Iron, Carbonates, Chlorides, Sulfates, Water quality, Water chemistry, Biology.

Hydrobiological prognosis basically reduces to weighting two factors accompanying outflow control: (1) blooming and overgrowth of a reservoir, depending on the growth possibilities of plant plankton or phytoplankton (trophicity of a reservoir), and (2) water quality viewed from the standpoint of possible growth of animal plankton (zooplankton) of various species typical of water of given quality (saprobicity of a reservoir). (Sims-ISWS)
W78-06880

PROCEEDINGS OF THE INTERNATIONAL SYMPOSIUM ON MARINE POLLUTION RESEARCH.
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 5G.
W78-06906

INVESTIGATION OF POLLUTION-STRESSED LITTORAL COMMUNITIES IN THE NORTHERN ADRIATIC,
Institut Rudjer Boskovic Inst. Zagreb (Yugoslavia). Center for Marine Research.
D. Zavodnik.
In: 'Proceedings of the International Symposium on Marine Pollution Research Held in Gulf Breeze, Florida on Jan 27-29, 1976,' Environmental Protection Agency, Office of Research and Development Report No EPA-600/9-76-032, January 1976. p 80-89, 12 ref.

Descriptors: *Water pollution effects, *Littoral, *Aquatic life, Benthos, *Adriatic Sea, Littoral communities.

The distribution and general features of several littoral communities in the northern Adriatic have been surveyed over the past 3 years with special regard to oil and ore pollution. Communities of the supralittoral rocks are generally unaffected by polluted waters, rather, they are distributed in relation to physiographical features of the habitat. The community of the mediolittoral rocks is most stable in polluted regions, but it can become deteriorated due to continuous oil influences. The most resistant organisms is the barnacle Chthamalus stellatus, which can survive under a layer of tar one centimeter thick. The most pollution-affected benthic communities are the biocoenosis of photophilic seaweeds and the beds of marine phanerogams, which vanished recently from vast areas in the northern Adriatic. The photophilic seaweeds are usually limited to a narrow zone in the upper infralittoral, but frequently are replaced by dense populations of the common sea urchin Paracentrotus lividus. Laboratory bioassays on the synergistic effects of lead and temperature salinity on selected benthic species (seaweeds, shellfish, crustacea, and fish) were conducted. (See also W78-06906) (Sinha-OEIS)
W78-06916

MICROBIOLOGY AND CHEMISTRY OF ESTUARINE SURFACE MICROLAYERS,
Environmental Research Lab., Gulf Breeze, FL; and Georgia State Univ., Atlanta. Dept. of Biology.
A. W. Bourquin, and D. G. Ahearn.
In: 'Proceedings of the International Symposium on Marine Pollution Research Held in Gulf Breeze, Florida on Jan 27-29, 1976,' Environmental Protection Agency, Office of Research and Development Report No EPA-600/9-76-032, January 1976. p 89-96, 3 fig, 3 tab, 23 ref.

Descriptors: *Oil spills, *Films, *Water pollution effects, *Microorganisms, Estuaries, Coasts, Industrial wastes, Sewage, Outer Continental Shelf, Surface microlayers.

Organic microlayers occur at the air-water interface of most bodies of water. The microlayer or 'sea slick' formation appears to be related mainly to decay of naturally occurring aquatic organisms or to their production of lipodial by-products. In coastal regions particularly, the direct activities of man are of increasing importance in the generation of surface slicks. Industrial and municipal sewage effluents constitute the major source of films and foams, but crude oil spillage appears to be a major contributor in localized areas. The role of surface film microorganisms in metabolism or co-metabolism of normally recalcitrant type molecules such as pesticides and heavy aromatic hydrocarbons are being investigated. Laboratory studies on the metabolism of organochlorine pesticides by hydrocarbon-degrading microorganisms may help determine the fate of these and other pollutants when they are concentrated in organically rich and microbiologically active estuarine surface microlayers. (See also W78-06906) (Sinha-OEIS)
W78-06917

RELATIONSHIP OF MARINE POLLUTION TO HUMAN HEALTH,
Environmental Protection Agency, Washington, D.C. Office of Research and Development.
R. Engle.
In: 'Proceedings of the International Symposium on Marine Pollution Research Held in Gulf Breeze, Florida on Jan 27-29, 1976,' Environmental Protection Agency, Office of Research and Development Report No EPA-600/9-76-032, January 1976. p 110-113.

Descriptors: *Water pollution effects, *Pollutants, *Food chains, *Toxins, Ecosystems, *Public health, Human health, Toxicants, Carcinogens.

Some toxic substances, carcinogenic compounds or biological agents are concentrated in invertebrates and lower vertebrates suggesting the possibility that these compounds could be transferred through the food chain to humans. A good example of biological magnification occurred when Japanese fishermen developed mercury poisoning from consuming fish from Minamata Bay. Superior methods must be developed to screen new chemicals for toxicity, especially since less than one-half of the new chemicals that go into major production are screened for carcinogenicity. The development of marine biomedicine will not be realized unless biomedical scientists, knowledgeable about human health problems, learn more about marine biology. Similarly, marine biologists, knowledgeable about the great variety of creatures of the sea, must learn more about biomedical problems and needs. Both will suffer if scientists fail to initiate integrated studies of the marine biota and human health. (See also W78-06906) (Sinha-OEIS)
W78-06918

EFFECT OF LEAD ON DINOPHYCEAE,
Biologische Anstalt Helgoland (West Germany).
S. M. Saifullah.
In: 'Proceedings of the International Symposium on Marine Pollution Research Held in Gulf Breeze, Florida on Jan 27-29, 1976,' Environmental Protection Agency, Office of Research and Development Report No EPA-600/9-76-032, January 1976. p 120-132, 6 fig, 4 tab, 29 ref.

Descriptors: *Water pollution effects, *Lead, *Toxicity, Heavy metals, *Dinophyceae.

The effect of lead on growth, chlorophyll 'a' concentration and rate of uptake of radioactive carbon by Prorocentrum micans and Scrippsiella faroens was studied with intergeneric differences evident. So far as cell numbers and chlorophyll 'a' concentrations were concerned no response to lead was shown by Prorocentrum micans; however, inhibitory effects of lead were visible in Scrippsiella faroens. Lead decreased rate of uptake radioactive carbon by both species. In general the effect of lead on the two species was mild and therefore can be considered the less toxic heavy metal. (See also W78-06906) (Sinha-OEIS)
W78-06920

BIOASSAYS AS INDICATORS OF POLLUTION EFFECTS,
Environmental Research Lab., Gulf Breeze, FL.
For primary bibliographic entry see Field 5A.
W78-06921

EFFECTS OF HYDROXAMIC ACIDS, IRON-SPECIFIC CHELATORS, ON THE GROWTH OF ALGAE,
Washington Univ., Seattle. Coll. of Seattle.
F. B. Taub, and K. M. Bailey.
Completion Report, September 25, 1977. 65 p, 25 fig, 4 tab, 62 ref. OWRT A-085-WASH(1), 14-34-0001-7102.

Descriptors: *Cyanophyta, *Algal growth, *Schizokinen, *Chelation, Algae, Hydroxamic acids, Iron, *Algal inhibition, Anabaena, Chlorella, Chlamydomonas, *Iron-specific chelators, Eutrophication, Water pollution effects, Bioassay, Lake water.

The tested hypothesis was that some species of algae may be selectively inhibited by trace element chelators excreted by other microorganisms, including blue-green algae. A ferric iron chelator, schizokinen, was obtained in a purified form from Anabaena sp. grown in a low-iron medium. This chelator inhibited the growth of Chlamydomonas reinhardi when in excess of the iron concentration. The inhibition was overcome by adding excess iron. The chelators apparently stimulated the growth of Chlorella vulgaris and Anabaena sp. itself. Another strong iron chelator, desferrioxamine-B from Streptomyces pilosus inhibited C. reinhardi. Selenastrum capricornutum, Ankistrodesmus sp. and others. Inhibition was overcome by adding excess iron. This compound did not inhibit Chlorella vulgaris or Anabaena sp. A weaker chelator, Rhodotorulic acid, was not inhibitory to ay of the species tested. Bio- and chemical assay showed that Anabaena sp., Chroococcus sp., Bacillus megaterium and Streptomyces viridochromogenes produce the iron chelators called hydroxamic acids. Small amounts of the chelators stimulate algal growth when iron is present as a hydrous ferric oxide by solubilizing this form of iron and making it available for algal uptake. Overchelation of iron prevents uptake by many algal species. the presence of this type of compound in lakes may affect species composition, blooms and dominance of blue-green algae. A

method for assay of lake water and obtaining iron chelators is presented.
W78-06930

DRINKING WATER AND HUMAN HEALTH: PART II,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 5A.
W78-06971

PETROLEUM HYDROCARBONS IN THE NORTHERN PUGET SOUND AREA--A PILOT DESIGN STUDY,
NOAA National Analytical Facility, Seattle, WA.
W. D. MacLeod, Jr., D. W. Brown, R. G. Jenkins, L. S. Ramos, and V. D. Henry.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 591, Price codes: A04 in paper copy, A01 in microfiche. E P A , Office of Research and Development, Interagency Energy-Environment Research and Development Program Series No EPA-600/7-77-098, Sept 1977. 60 p, 5 fig, 12 tab, 11 ref, 2 append. Also as: NOAA Technical Memorandum ERL MESA-8, Nov 1976.

Descriptors: *Washington, *Water pollution effects, *Oil pollution, *Baseline studies, *Bioindicators, Sediments, Mussels, Snails, Biota, Analytical techniques, *Outer Continental Shelf, *Petroleum hydrocarbons, Residual hydrocarbons, Puget Sound(WA), Strait of Juan de Fuca, Mytilus edulis, Mytilus californianus, Thais lamellosa.

This pilot study has demonstrated that methodology exists to detect and measure a number of hydrocarbons in sediments, mussels (Mytilus edulis and M. californianus), and a snail (Thais lamellosa). The use of this methodology in an area relatively polluted with oil (Port Angeles) and in a relatively unpolluted area (Dungeness Bay) has revealed substantial quantitative differences in these compounds. During the first year, major emphasis should be given to seasonal variations and broad geographical coverage with minor effort devoted to widening the list of compounds and trophic levels under study. Work should continue to emphasize analysis of sediments since this is where indications of the accumulation of petroleum contamination can be expected. Past and current problems with water column analyses preclude main reliance on water as a sample matrix but further study of it is warranted. A number of parameters important in baseline studies are undefined. For example, the optimum interval for sampling for baseline studies has not been established; seasonal differences are unknown. Areas having the highest and lowest probable petrogenic contamination thus should be sampled more frequently. If hydrocarbon levels in these areas fluctuate significantly, the program should be flexible enough to allow even more frequent sampling. Although trophic levels were treated minimally in the pilot study (snails which feed on the mussels), this area of study could be expanded. (Sinha-OEIS)
W78-06981

OFFSHORE OIL AND GAS EXTRACTION: AN ENVIRONMENTAL REVIEW,
Battelle Columbus Lab., OH.
For primary bibliographic entry see Field 5B.
W78-06983

RECREATIONAL REUSE OF MUNICIPAL WASTEWATER--PHASE II,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 5G.
W78-06997

EVALUATION OF FACTORS PROMOTING THE PRESERVATION OF AQUATIC ECOSYSTEMS IN RECLAIMED STRIP MINE AREAS,
Grover City Coll., PA. Dept. of Biology.
For primary bibliographic entry see Field 5G.
W78-06998

PO210 AND PB210 IN ZOOPLANKTON FECAL PELLETS,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
For primary bibliographic entry see Field 5B.
W78-07018

OIL SPILL DISPERSANTS CAUSE BRADYCARDIA IN A MARINE FISH,
Fisheries and Marine Service, Saint John's (Newfoundland).
J. W. Kiceniuk, W. R. Penrose, and W. R. Squires.
Marine Pollution Bulletin, Vol 9, No 2, p 42-45, 1978. 2 fig, 1 tab, 13 ref.

Descriptors: *Oil spills, *Oil pollution, *Detergents, *Fish physiology, *Oxygen demand, *Respiration, *Toxicity, *Fish behavior, Surfactants, Water pollution effects, Bioassay, Heart, *Bradycardia, *Dispersants, *Cunner, *Tautogolabrus.

The symptoms of detergent poisoning have been observed to be similar to those of asphyxic hypoxia. If hypoxia is in any way involved in the toxicity of detergents the sublethal physiological effects of the detergents in oil dispersants would be expected to be similar to the effect of hypoxia alone. When subjected to hypoxia fish decrease their heart rate and increase ventilation volume. This study found that oil dispersants caused bradycardia in fish similar to the effect of hypoxia. The bradycardia was sustained for the duration of exposure and was reversible. (Deal - EIS)
W78-07019

SIZE-SELECTIVE MORTALITIES OF CLAMS IN AN OIL SPILL SITE,
Maine State Dept. of Marine Resources, Augusta.
R. L. Dow.
Marine Pollution Bulletin, Vol. 9, No. 2, p 45-48, 1978. 2 fig, 3 tab, 2 ref.

Descriptors: *Mortality, *Toxicity, *Oil spills, *Oil pollution, *Fuels, *Clams, *Shellfish, *Bottom sediments, *Soil contamination, *Juvenile growth stage, Growth rates, Growth stages, Water pollution sources, Water pollution effects, *Spatfall.

In March 1971, a mixture of No. 2 fuel oil and JP 5 jet fuel spilled into Long Cove, Searsport, Maine. It became concentrated locally at levels up to more than 250 ppm in intertidal sediments from 15 to 25 cm below the surface. This oil continued to kill successive year classes juvenile clams as they burrowed down through redistributed overlying clean sediments into the oil until 1977. (Deal-EIS)
W78-07020

ANESTHETIC AND HANDLING STRESS ON SURVIVAL AND CORTISOL CONCENTRATION IN YEARLING CHINOOK SALMON (ONCORHYNCHUS TSAWYTSCHA),
Oregon Cooperative Fishery Research Univ. Corvallis.
R. J. Strange, and C. B. Schreck.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 345-349, 1978. 2 fig, 1 tab, 9 ref.

Descriptors: *Fish handling facilities, *Salmon, *Chinook salmon, *Fish physiology, *Toxicity, *Mortality, *Animal metabolism, Fish management, *Salinity, *Fish behavior, Salmonids, *Anesthetics, *Cortisol, *MS-222, *Handling stress(Fish).

Brief anesthetization with 50 mg/L buffered MS 222 (ethyl m-aminobenzoate methane-sulfonate) of yearling chinook salmon during mild handling caused no change in plasma cortisol concentrations compared with levels in non-anesthetized fish. Prolonged exposure (180 min) to a depressing dose of buffered MS-222 (25 mg/L) elevated cortisol more than an immobilizing dose (50 mg/L), while 100 mg/L was lethal within 30 min. Fish anesthetized (50 mg/L MS-222) during a severe 30 min handling stress had significantly lower mortality than controls to a second handling stress applied when the fish were no longer anesthetized. Anesthetization during the first stressor also prevented the cortisol stress response evident in the control fish. Anesthetic (with or without buffer) administered before initial capture was most effective at increasing survival during a second stressor, while anesthetic supplied after initial capture may have been slightly less effective. (Deal-EIS)
W78-07021

REQUIEM FOR A RIVER. POLLUTION OF THE MOISIE AND PEKANS RIVER,
M. Campbell.
Atlantic Salmon Journal, No. 1, p 17-20, 1978. 8 fig.

Descriptors: *Mine wastes, *Mine water, *Industrial wastes, *Salmon, *Atlantic salmon, *Fish behavior, Fish physiology, *Fish food organisms, *Suspended solids, Water pollution sources, Salmonids, Canada, *Moise River, *Pekans River, Quebec.

The pollution of the Moisie River Watershed (Canada) is described. Wastewater from an iron ore concentrator reduced visibility in the water to zero, thus inhibiting the visual stimulus necessary for salmon spawning. Further, the suspended sediments prevent penetration of sunlight necessary for photosynthesis in fish food organisms. (Deal-EIS)
W78-07022

SORPTION OF ARSENIC AND CADMIUM AND THEIR EFFECTS ON GROWTH, MICRONUTRIENT UTILIZATION, AND PHOTOSYNTHETIC PIGMENT COMPOSITION OF ASTERIONELLA FORMOSA,
Argonne National Lab., IL. Radiological and Environmental Research Div.
H. L. Conway.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 286-294, 1978. 5 fig, 6 tab, 30 ref.

Descriptors: *Arsenic, *Cadmium, *Growth rates, *Toxicity, *Absorption, *Photosynthesis, *Diatoms, Population, Path of pollutants, Cytological studies, Aquatic environment, Pigments, Bioaccumulation, *Asterionella.

By use of continuous-culture techniques, populations were exposed to various concentrations of arsenic or cadmium for periods of 6-23 days. Sorption of arsenic (as arsenate) was a linear function of ambient concentrations less than 130 micro g As L-1 but reached an apparent plateau at ambient values greater than 130 micro g As L-1. In contrast, cadmium sorption was a complex function of ambient concentration and time. Fractionation experiments suggest that a large proportion of the cellular arsenic was associated with the organic layer surrounding the frustule, while most of the cellular cadmium was associated with the cell contents. (Deal-EIS)
W78-07024

MICROELEMENTS OF IRON AND COPPER IN LIVER AND MUSCLES OF RAINBOW TROUT (SALMO GAIRDNERI RICHARDSON) FROM DIFFERENT HATCHERIES,
Sarajevo Univ. (Yugoslavia). Bioloski Inst.
For primary bibliographic entry see Field 5A.

W78-07026

THE UPTAKE OF BORON BY LEMNA MINOR,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
R. P. Glandon, and C. D. McNabb.
Aquatic Botany, Vol 4, p 53-64, 1978. 2 fig, 2 tab, 22 ref.

Descriptors: *Absorption, *Boron, *Growth rates, *Plant growth, *Plant physiology, *Plant tissues, *Growth stages, *Aquatic plants, Metabolism, Biomass, *Bioaccumulation, *Lemna, *Ceratophyllum, *Macrophytes.

This study characterizes Lemna minor L. as a bioaccumulator of boron relative to other species of aquatic macrophytes. Laboratory experiments using 0.01, 0.11, and 1.01 mg B l-1 indicated that ambient boron was a determining factor in rate of boron accumulation in plant tissue. Field studies showed that the tissue boron concentration of L. minor, growing on the canopy of submerged Ceratophyllum demersum L. and presumably drawing from the same boron supply, was 10-45 times greater than the tissue boron concentration of C. demersum. In this instance, L. monor had a growing season maximum of near 3200 microgram B g-1 ash-free dry weight. The laboratory and field data further suggest that growth rate and uptake rate are both important in determining the tissue concentration of boron. (Deal - EIS)
W78-07027

THE EFFECT OF HYPEROXIA ON THE BREATHING OF MARINE FISHES,
Laboratoire de Physiologie Respiratoire, Strasbourg (France). Station Biologique de Roscoff.
P. Dejours, A. Toulmond, and J. P. Truchot.
Comparative Biochemistry and Physiology, Vol. 58A, p 409-411, 1977. 3 fig, 1 tab, 10 ref.

Descriptors: *Oxygen, *Respiration, Fish behavior, Fish physiology, *Oxygen requirements, *Bass, *Mullets, *Teleosts, *Elasmobranchs, *Marine fish, Sea water, *Dogfish, *Wrasse, *Gurnard, *Pollack.

Oxygen tensions of inspired and expired respiratory waters were measured in seven species of elasmobranch and teleost fishes breathing normoxic or hyperoxic sea water. From these measurements, the oxygen extraction coefficient and the ventilatory requirement--an index of the ventilatory activity--were calculated. Hyperoxia decreased the ventilatory requirement by a factor of 2-5 with respect to normoxia, the O2-extraction coefficient did not change significantly. These observations support the conclusion that the oxygenation of the milieu controls the level of the ventilatory activity in the water breathers. (Deal-EIS)
W78-07028

EFFECTS OF THE WATER SOLUBLE FRACTION OF EKOFISK CRUDE OIL ON ZOEAL LARVAE OF THE CRAB HYAS ARANEUS,
Zoologisk Museum, Oslo (Norway).
M. E. Christiansen, and F. C. Stormer.
Ambio, Vol 7, No 1, p 23-25, 1978. 2 fig, 2 tab, 11 ref.

Descriptors: Solubility, *Oil pollution, *Oil spills, *Larval growth stage, *Toxicity, *Mortality, *Crabs, Commercial shellfish, *Growth rates, *Plankton, Water pollution effects, Growth stages, Crustaceans, *Crude oil, *Zoeae, Hyas.

Effects of the water soluble fraction of crude oil were tested on zoeal larvae of the brachuran crab Hyas araneus. The water soluble fraction had no acute effect on survival at concentrations of 0.3, 1.5, and 3.0 ppm hydrocarbons. A long-term effect on survival was observed at the 3.0 ppm concentration. While 95-100 percent of the first zoeal larvae survived to the meglopa stage in the control and in the two lower concentrations of hydrocarbons, only 25 percent reached this stage at 3.0 ppm. It was also found that the duration of zoeal development lengthened significantly with an increase in hydrocarbon concentrations. (Deal - EIS)
W78-07029

LETHAL AND SUBLETHAL EFFECTS OF DREDGING ON REEF CORALS,
Caraibisch Marien-Biologisch Inst., Curacao (Netherlands Antilles).
R. P. M. Bak.
Marine Pollution Bulletin, Vol 9, No 1, p 14-16, 1978. 2 fig, 1 tab, 15 ref.

Descriptors: *Dredging, *Coral, *Calcium carbonate, *Reefs, *Channel improvement, *Light penetration, *Light intensity, *Bottom sediments, *Growth rates, *Suspended solids, *Sediments, *Mortality, Marine animals, Colonies.

Effects of dredging on a coral reef are described. Under water light values at a depth of 12-13 m were reduced from about 30% to less than 1% surface illumination. Colonies of coral species which are inefficient sediment rejectors (Porites astreoides) lost their zooxanthellae and died. Calcification rates in Madracis mirabilis and Agaricia agaricities were observed to decrease by 33%. The period of suppressed calification exceeds that of environmental disturbance. (Deal - EIS)
W78-07030

THE EFFECT OF HEAVY METALS ON THE SURVIVAL, REPRODUCTION, DEVELOPMENT, AND LIFE CYCLES FOR TWO SPECIES OF POLYCHAETOUS ANNELIDS,
California State Univ., Long Beach. Dept. of Biology.
D. J. Reish, and R. S. Carr.
Marine Pollution Bulletin, Vol 9, No 1, p 24-27, 1978. 2 tab, 12 ref.

Descriptors: *Heavy metals, *Reproduction, Cadmium, Chromium, Copper, Lead, Mercury, Zinc, *Toxicity, *Mortality, *Lethal limit, *Annelids, *Growth rates, Life cycles, Water pollution effects, Effluents, *Polychaetes.

The effects of exposure of six metals on survival and reproduction in tow species of polychaetous, Ctendrilus serratus and Ophryotrocha diadema, possessing short life histories were measured. The suppression of reproduction was generally two orders of magnitude less than the 96 h LC50. (Deal - EIS)
W78-07032

PRODUCTION PROCESSES UNDER THE ICE IN LAKE ST. CLAIR I. IRRADIATION AND TEMPERATURE,
Windsor Univ. (Ontario). Dept. of Biology.
D. G. Wallen.
Water Resources Bulletin, Vol. 13, No. 2, p 299-307, April 1977. 5 fig, 1 tab, 20 ref.

Descriptors: *Lakes, *Phytoplankton, *Ice, Effects, *Primary production, Standing crops, Chlorophyll a, Irradiation, Temperature, Winter, Lake St. Clair(Canada), Rivers, Nutrients, Measurement, Sampling.

Data from three ice-covered stations in Lake St. Clair were collected to evaluate the effect of ice and related variables on phytoplankton production. Primary production, phytoplankton standing crop, irradiation and temperature were measured from January to April, 1973. Mean production values ranged from 0.74 mgC/m3/h at station 1 near Mitchell Bay to 3.4 mgC/m3/h in waters at stations 2 and 3. Temperature stratification occurred at the three stations. However, the temperatures at station 1 were consistently more than a degree warmer than at the other two stations. Irradiation was low, having a mean value at the sampling depth of .075 ly/min. The data is interpreted to indicate that the ice-bound phytoplankton were adapted to the low irradiation. It is suggested that the variation observed between stations is related to the formation of a plume by the Thames River and differences in nutrient loads carried by the St. Clair and Thames Rivers. (See also W78-07040) (Bell-Cornell)
W78-07039

PRODUCTION PROCESSES UNDER THE ICE IN LAKE ST. CLAIR II. NUTRIENTS (SILICATE) AS A LIMITING FACTOR,
Windsor Univ. (Ontario). Dept. of Biology.
D. G. Wallen, and E. Tuppling.
Water Resources Bulletin, Vol. 13, No. 3, p 515-520, June 1977. 3 fig, 1 tab, 16 ref.

Descriptors: *Lake St. Clair(Canada), *Nutrients, *Primary production, *Ice, Chlorophyll a, Limiting factors, Phytoplankton, Winter, Measurement.

During the winter of 1972, nutrient concentrations beneath the ice (and snow when present) were measured at three stations in Lake St. Clair. Nutrient patterns are herein compared and discussed in relation to primary production. Typically nutrient concentrations were high for a few weeks after ice formation and high again in the spring with mid-winter declines. At station 3, soluble reactive silica appeared to influence primary production and chlorophyll a. Nutrient limitation was not detected at the other two stations. The nutrient patterns, primary production and temperature provide evidence that a water mass or plume peculiar to the inflowing Thames River moves down the southeastern side of the lake beneath the ice. (See also W78-07039) (Bell-Cornell)
W78-07040

PRODUCTION AND ECOLOGY OF EELGRASS (ZOSTERA MARINA L.) IN GREVELINGEN ESTUARY, THE NETHERLANDS, BEFORE AND AFTER THE CLOSURE,
Delta Inst. for Hydrobiological Research, Yerseke (Netherlands).
For primary bibliographic entry see Field 2I.
W78-07063

THE MYXOPHYCEAE OF THE MARSHES OF SOUTHERN DELAWARE,
Delaware Univ., Newark. School of Life and Health Sciences.
R. D. Ralph.
Chesapeake Science, Vol. 18, No. 2, p 208-221, June, 1977. 1 fig, 7 tab, 25 ref.

Descriptors: *Marshes, *Cyanophyta, *Delaware, *Spatial distribution, Wetlands, Coastal marshes, Tidal marshes, Salt marshes, Aquatic algae, Distribution patterns, Biological communities, Environmental effects, Habitats.

Thirty-six species of blue-green algae were observed in collection from the marshes of southern Delaware. All major vegetational zones support a single myxophycean association dominated by the three primary oscillatoriaceous species--Microcoleus lyngbyaceus, Schizothrix calcicola, and Schizothrix arenaria. All three species contribute to the formation of coherent mats over the marsh sediments in bare areas subject to alternate periods of inundation by salt water and exposure. Firm mats are not produced unless S. arenaria is present in abundance. Pannes and pools support the largest populations of blue-green algae in the summer. Significant but reduced populations overwinter in mats of macroscopic green algae and among the dead, lodged culms of the grasses of the high and low marshes. The availability of light at the sediment surface and the extent to which it is attenuated by the marsh angiosperms are the

major factors determining the distribution of the algae on the marshes. It is suggested that the pyxophycean association found on the marshes of southern Delaware may, with certain reservations, be taken as the type of a single ubiquitous, endemic temperature North Atlantic blue-green algal association. (Steiner-Mass)
W78-07069

OBSERVATIONS ON THE GROWTH OF SPHAGNUM CUSPIDATUM IN A BOG POOL ON THE SILVER FLOWE NATIONAL NATURE RESERVE,
Hull Univ. (England). Dept. of Plant Biology.
D. J. Boatman.
Journal of Ecology, Vol. 65, p 119-126, 1977. 2 fig, 4 tab, 8 ref.

Descriptors: *Bogs, *Mosses, *Plant growth, *Productivity, Wetlands, Aquatic plants, Standing waters, Plant populations, Community development, Environmental effects, Biological communities, Seasonal, Chlorophyll, *Sphagnum, *Silver Flowe National Nature Reserve(Scotland), Bog pools.

The growth of Sphagnum cuspidatum was measured from two sources, a bog-surface pool and a lagg-pool. Sphagnum in the lagg-pool had a lower total dry weight, greater capitulum dry weight, and higher concentrations of chlorophyll, nitrogen, potassium, and magnesium initially. They produced more extension-growth and more innovations. The low rate of innovations in the bog-surface pool suggests that ombrotrophic conditions are sub-optimal for growth and production. In summer, shoots floating freely in pool tend to be moved about the pool by wind and heaped together at the ends and bays. In winter, shoots sink to the bottom and some are smothered by others. The results of one experiment indicated that the new growth produced by partially smothered for several months will die, and if only 10% of them die in this way a year, it is obvious that innovation production will be insufficient to maintain the population of shoots in a pool. Smothering and a low rate of innovation production could therefore be important factors limiting the ability of S. cuspidatum to occury fully the bog pools.
W78-07070

ABUNDANCE AND PRODUCTION OF MACROINVERTEBRATES FROM NATURAL AND ARTIFICIALLY ESTABLISHED SALT MARSHES IN NORTH CAROLINA,
North Carolina State Univ. at Raleigh. Dept. of Zoology.
For primary bibliographic entry see Field 2L.
W78-07084

ENVIRONMENTAL CHEMICALS: HUMAN AND ANIMAL HEALTH, AUGUST 7-11, 1972, FORT COLLINS, COLORADO.
Colorado State Univ., Fort Collins. Inst. of Rural Environmental Health.
For primary bibliographic entry see Field 5B.
W78-07134

TRACE ELEMENTS IN WATER,
Environmental Protection Agency, Denver, CO.
For primary bibliographic entry see Field 5B.
W78-07135

MOLYBDENUM AS AN ENVIRONMENTAL POLLUTANT,
Colorado State Univ., Fort Collins. Dept. of Animal Science.
For primary bibliographic entry see Field 5B.
W78-07137

LEAD IN SOILS AND PLANTS,
Colorado State Univ., Fort Collins. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 5B.
W78-07138

CHEMICALS IN THE WATERS OF THE ROCKY MOUNTAIN REGION,
Colorado State Univ., Fort Collins, Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W78-07139

NITRATES: HUMAN AND ANIMAL HEALTH,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W78-07140

POLYCHLORINATED BIPHENYLS: AN INDUSTRIAL POLLUTANT,
Colorado State Univ., Fort Collins. Dept. of Entomology.
For primary bibliographic entry see Field 5B.
W78-07141

VEGETATION ON ROCKY SHORES AT SOME NORTH IRISH SEA SITES,
Liverpool Univ. (England). Hartley Botanical Labs.
G. Russell.
Journal of Ecology, Vol. 65, p 485-495, 1977. 3 fig, 13 ref.

Descriptors: *Aquatic plants, *Intertidal areas, *Water pollution effects, Rooted aquatic plants, Algae, Beaches, Aquatic habitats, Water pollution, Biomass, Census, Intertidal vegetation, Hilbre Island(England), River Dee(England), Isle of Man(England), New Brighton(England).

The intertidal vegetation of Hilbre Island, Merseyside, has undergone a major floristic change involving a considerable reduction in the number of species due to the light pollution of the River Dee. Its vegetation was compared with unpolluted localities on the Isle of Man and with that of New Brighton, Merseyside, which is grossly polluted. The Hilbre and New Brighton samples may be assigned either to the littoral fringe or to the eulittoral zone but not the sublittoral fringe. The Hilbre samples were floristically between those of New Brighton and the Isle of Man. This intermediate character is also apparent in species diversity, life-form composition, biomass and dominance. These features, together with historical evidence, illustrate the process of degradation which the Hilbre vegetation has undergone throughout this century, and suggest possible future trends. (Steiner-Mass)
W78-07155

NITROGEN FIXATION BY ALGAE IN A MASSACHUSETTS SALT MARSH,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 2L.
W78-07157

THE GROWTH OF AQUATIC MACROPHYTES IN THE BAY OF QUINTE PRIOR TO PHOSPHATE REMOVAL BY TERTIARY SEWAGE TREATMENT (1975-1976),
Queen's Univ., Kingston (Ontario). Dept. of Biology.
J. W. Bristow, A. A. Crowder, M. R. King, and S. Vanderkloet.
Le Naturaliste Canadien, Vol. 104, p 465-473, 1977. 2 fig, 2 tab, 25 ref.

Descriptors: *Aquatic plants, *Distribution patterns, *Sewage treatment, Rooted aquatic plants, Biomass, Productivity, Eutrophication, Tertiary treatment, Plant growth, Phosphates, Water pollution sources, *Canada, *Bay of Quinte(Ontario), Aquatic macrophytes.

In a study of the distribution of aquatic macrophytes in the Bay of Quinte (southeastern Ontario), fewer species and a lower density of cover were recorded in the upper portion of the Bay. Biomass was generally low. The poorer macrophyte growth in the shallow nutrient-rich upper Bay was probably a result of algal blooms and high turbidity of the water, but the absence of suitable substrate might also be a contributing factor. The lower Bay was similar to adjacent areas of Lake Ontario in species composition and density of plant cover. (Steiner-Mass)
W78-07160

THE DECOMPOSITION OF STANDING AND FALLEN LITTER OF TYPHA GLAUCA AND SCIRPUS FLUVIATILIS,
Iowa State Univ., Ames. Dept. of Botany and Plant Pathology.
C. B. Davis, and A. G. Van Der Valk.
Canadian Journal of Botany, Vol. 56, p 662-675, 1978. 8 fig, 1 tab, 29 ref.

Descriptors: *Freshwater marshes, *Cattails, *Bulrush, *Cycling nutrients, Wetlands, Marshes, Marsh plants, Aquatic plants, *Iowa, Detritus, Biomass, Leaching, Nutrients, Microorganisms, *Goose Lake(Iowa).

Changes in dry weight and N, P, K, Na, Ca, Mg, Al, and Fe content were studied in decomposing Typha glauca and scirpus fluviatilis shoots. Submerged Typha litter decomposed more rapidly than submerged Scirpus litter, losing 50% of its original dry weight in 325 days while Scirpus litter still retained 62% of its original dry weight after 525 days. Major pathways of mineral flow from standing litter were leaching during the first few weeks after shoot death and fragmentation and litter fall during the rest of the study. Mineral losses from fallen liter were mainly due to leaching or to excretion by microbial populations associated with the litter. Microbial uptake (N,P) and adsorption (Ca, Al, Fe) were important processes in the fallen litter. At the end of the study, the calculated combined dry weight of undecomposed standing and fallen litter had decreased by only 20% in Typha litter and 14% in Scirpus litter. Most of the biomass and minerals were in fallen litter. (Steiner-Mass)
W78-07162

POTATO PROCESSING PLANT LIQUID EFFLUENT REGULATIONS AND GUIDELINES.
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
For primary bibliographic entry see Field 5G.
W78-07174

HISTOPATHOLOGICAL EFFECTS OF INTERMITTENT CHLORINE EXPOSURE ON BLUEGILL (LEPOMIS MACROCHIRUS) AND RAINBOW TROUT (SALMO GAIRDNERI),
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
M. L. Bass, C. R. Berry, Jr., and A. G. Heath.
Water Research, Vol. 11, No. 8, 1977, p 731-735, 9 fig, 39 ref.

Descriptors: Environmental effects, *Water pollution effects, Chlorine, Fish, Trout, Bioassay, Fish pathology, *Rainbow trout, *Sunfishes.

Fish were exposed to multiple pulses (45 min three times a day at 8-h intervals for 7d) of free residual chlorine to achieve peak total residual chlorine concentrations of 0.21, 0.31, 0.41, and 0.52 mg/l. Tests were run at 15, 25 and 32C. 96 h LC50 values for bluegill in these tests was 0.44 mg/l with temperature having only slight effect on this value. Moderate gill hyperplasia and swelling of the

lamellar epithelial cells resulted at sublethal concentrations while lethal concentrations caused extensive hyperplastic lesions of gill epithelium. Hepatic glycogen depletion was attributed to the stressful effects of the arterial hypoxia produced by chlorine damage to the gills. Liver necrosis was found at chlorine concentrations of 0.4 or 0.5 mg/l at 25 and 32C. No histological changes were found in either trout or bluegill kidney. (Chilton-ORNL)
W78-07178

THE UPTAKE OF HEAVY METALS BY EPIPHYTIC BACTERIA ON ALISMA PLANTAGO-AQUATICA,
Otago Univ., Dunedin (New Zealand). Dept. of Microbiology.
F. M. Patrick, and M. W. Loutit.
Water Research, Vol. 11, No. 8, 1977, p 699-703, 2 fig, 3 tab, 19 ref.

Descriptors: Environmental effects, *Water pollution effects, *Bacteria, Heavy metals, Aquatic plants, Absorption, *Epiphytic bacteria, Bioaccumulation.

Bacterial epiphytes on the surface of Alisma plantago-aquatica were found to be a major factor in contributing to the total metal concentrations of the plant. Concentrations of Cr, Cu, Fe, Pb, and Zn were reduced by removal of the epiphytes from the surface of plant leaves. It was concluded that bacterial epiphytes may contribute significantly to the concentrations of heavy metals measured in aquatic plants from both polluted and unpolluted sources. (Chilton-ORNL)
W78-07179

AQUATIC BACTERIAL POPULATIONS AND HEAVY METALS - I. COMPOSITION OF AQUATIC BACTERIA IN THE PRESENCE OF COPPER AND MERCURY SALTS,
Texas Univ. Health Science Center at Houston. School of Public Health.
F. L. Singleton, and R. K. Guthrie.
Water Research, Vol. 11, No. 8, 1977, p 639-642, 4 fig, 1 tab, 7 ref.

Descriptors: Environmental effects, *Water pollution, *Heavy metals, *Copper, *Mercury, Populations, *Bacteria, Biological communities, Community stability, Diversity, Total colony forming units.

The naturally occurring bacterial populations of two aquatic systems were evaluated for the effect of additions of copper and mercury upon the populations. The addition of either element singularly or of both elements together resulted in an increase in total colony forming units (TCFU), a reduction in diversity, and a variation in the percentage chromagens in the population. It was concluded that heavy metal addition reduces bacterial community stability by the reduction in diversity coincident with increased TCFU of surviving organisms. (See also W78-07181) (Chilton-ORNL)
W78-07180

AQUATIC BACTERIAL POPULATIONS AND HEAVY METALS - II. INFLUENCE OF CHEMICAL CONTENT OF AQUATIC ENVIRONMENTS ON BACTERIAL UPTAKE OF CHEMICAL ELEMENTS,
Texas Univ. Health Science Center at Houston. School of Public Health.
R. K. Guthrie, F. L. Singleton, and D. S. Cherry.
Water Research, Vol 11, No 8, 1977, p 643-646, 3 tab, 10 ref.

Descriptors: Environmental effects, *Water pollution, *Heavy metals, *Copper, *Mercury, *Bacteria, Absorption, Halides, Metals, Bioaccumulation.

The naturally occurring bacterial populations in three aquatic systems (a coal ash basin, a brackish lake, and a freshwater lake) containing different levels of chemical element concentration and salinity were found to increase their uptake of certain elements following addition of at least twice the EPA recommended limits of Cu and Hg for surface water. In the presence of added Cu or Hg in brackish water, concentrations of active metals and halogens were generally decreased in bacterial cells. In ash basin water, these concentrations varied as did concentrations of light metals in both brackish and ash basin water. In freshwater, the bacterial cell concentration of all light and active metals and the halogens was increased in the presence of Cu or Hg. (See also W78-07180) (Chilton-ORNL)
W78-07181

THE EFFECTS OF DEPRESSED PH ON FLAGFISH REPRODUCTION, GROWTH AND SURVIVAL,
Ontario Ministry of the Environment, Rexdale. Limnology and Toxicity Section.
G. R. Craig, and W. F. Baksi.
Water Research, Vol. 11, No. 8, 1977, p 621-626, 4 fig, 3 tab, 24 ref.

Descriptors: Environmental effects, *Water pollution effects, *Hydrogen ion concentration, Fish, Reproduction, *Growth rates, Mortality, Water quality, *Flagfish, Jordanella floridae.

Breeding communities of flagfish, Jordanella floridae, were exposed to depressed pH levels of 6.0, 5.5, 5.0, and 4.5. The order of sensitivity of life stages at the 50% reduction level was: egg production>fry survival>fry growth>egg fertility. Egg production was reduced by about 50% under pH 6.0 conditions. Egg fertility and fry growth were both reduced by about 20% at pH 6.0. Overall reduction in recruitment in a flagfish community was about 32% at pH 6.0. (Chilton-ORNL)
W78-07183

EFFECT OF TEMPERATURE INCREASES ON THE SIZE AND WEIGHT OF SOME INVERTEBRATE POPULATIONS IN THE COOLING RESERVOIR OF THE KURAKHOVSK STATE REGIONAL ELECTRIC POWER PLANT, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
L. A. Kititsyna, and O. A. Sergeeva.
Ekologiya 5, p 99-102, 1976.

Descriptors: *Thermal pollution, *Invertebrates, Benthic animals, Water pollution effects, Electric powerplants, *Ceriodaphnia-reticulata, *Daphnia-cucullata, *Diaphanasoma-brachyurum, *Pontogammarus-robustoides, *Ukrainian-SSR, USSR, Valvata-piscinalis.

Five populations of benthic invertebrates (Diaphanasoma brachyurum, Daphnia cucllata, Ceriodaphnia reticulata, Valvata piscinalis and Pontogammarus robustoides) inhabiting different temperature regimes of the Kurakhovsk thermal electric power plant cooling reservoir (Ukrainian SSR, USSR) were analyzed. The size and weight of organisms living in heated water (17 degrees C) was 16-58% greater than those living under normal water temperatures (control = 12 degrees C).--Copyright 1978, Biologica Abstracts, Inc.
W78-07184

RADIOCESIUM DYNAMICS IN HERONS INHABITING A CONTAMINATED RESERVOIR SYSTEM,
Savannah River Ecology Lab., Aiken, SC.
A. H. Domby, D. Paine, and R. W. McFarlane.
Health Physics, Vol. 33, No. 6, December 1977, p 523-532, 6 fig, 3 tab, 35 ref.

Descriptors: Environmental effects, *Water pollution, *Radionuclides, *Cesium radioisotopes, Reservoirs, Birds, *Herons, Nestlings, Body burdens.

Two species of herons, the little blue heron and the green heron, both of which nest on the same radioactivity contaminated reservoir, showed marked differences in radiocesium levels. Nestlings from different nests of the little blue heron showed significant differences of radiocesium body burdens; nestling within the same nest did not exhibit strong differences in body burdens. Radiocesium levels in food from the crops of little blue heron nestlings had a high correlation with the observed levels in the nestlings. A primary food item of the blue heron colony, the bluegill, has significant differences of mean radiocesium levels within the reservoir system in which the herons forage for food as a result of differential radionuclide contamination. The little blue heron tended to spatially partition available foraging areas within the contaminated reservoir, while the green heron foraged primarily in Carolina bays around the system. Nestlings of green heron showed low radiocesium body burdens. (Chilton-ORNL)
W78-07185

RADIATION DOSES AND EFFECTS ESTIMATED FOR AQUATIC BIOTA EXPOSED TO RADIOACTIVE RELEASES FROM LWR FUEL-CYCLE FACILITIES,
Oak Ridge National Lab., TN. Environmental Sciences Div.
B. G. Blaylock, and J. P. Witherspoon.
Nuclear Safety, Vol. 17, No. 3, May-June 1976, p 351-361, 8 tab, 26 ref.

Descriptors: Environmental effects, *Water pollution effects, *Radioactivity, *Radionuclides, Nuclear reactors, Nuclear wastes, Aquatic life, Hazards, *Biota.

The objectives of this study were to estimate the radiation dose received by aquatic biota from process in the nuclear fuel cycle, to determine the major dose-contributing radionuclides and to assess the impact of estimated doses on aquatic biota. Higher doses were found to be due to naturally occurring radionuclides, Ra226, Po210, and Th230. It was concluded that somatic or genetic effects produced on aquatic biota at the dose rates estimated for conversion, enrichment, fuel fabrication, nuclear power reactor, and reprocessing facilities would not significantly affect the exposed aquatic populations. Dose-rate estimates for aquatic biota from milling and mining operations were much higher than estimates from other facilities in the nuclear fuel cycle. (Chilton-ORNL)
W78-07186

EVALUATION OF THE RADIOACTIVE WASTES DISPOSAL INTO THE DEEP OCEAN,
Kyoto Univ. (Japan). Dept. of Sanitary Engineering.
For primary bibliographic entry see Field 5E.
W78-07187

ACUTE TOXICITY OF SELECTED HYDRAZINES TO THE COMMON GUPPY,
Aerospace Medical Research Lab., Wright-Patterson AFB, OH.
A. R. Slonim.
Water Research, Vol. 11, No. 10, 1977, p 889-895, 4 tab, 16 ref.

Descriptors: Environmental effects, *Water pollution effects, *Toxicity, Fish, *Organic compounds, Aquatic environments, Water quality, *Hydrazines, Guppy.

The paper presents the results of static bioassays conducted in series for a period of over a year to obtain median lethal concentration (LC50) values for hydrazine, unsymmetrical dimethylhydrazine (UDMH), Aerozine-50 and monomethylhydrazine. LC50 values for hydrazine, Az-50 and MNH were in the same concentration range in hard water and soft water and were reduced over time. Hydrazine

was the most toxic compound while UDMH was the least toxic compound and the only one more toxic in hard water than in soft water. All four compounds caused some degree of distress in surviving fish. Investigations with pre-exposed and previously unexposed fish indicated that the toxic effects of the hydrazines are cumulative. (Chilton-ORNL)
W78-07188

ALGAL NUTRIENT LIMITATION IN LAKE ONTARIO AND TRIBUTARY WATERS,
Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.
N. Sridharan, and G. F. Lee.
Water Research, Vol. 11, No. 10, 1977, p 849-858, 10 fig, 4 tab, 1 ref.

Descriptors: Environmental effects, *Nutrients, Phosphorus, *Algae, Growth rates, Plant growth, Wastes, *Lake Ontario, Eutrophication, Water pollution control.

A nutrient enrichment study was conducted in Lake Ontario during 1972-1973 as part of the International Field Year for Great Lakes. The study included the measurements of the growth response of laboratory-grown and natural algae in nutrient enriched water. Based on results of the study, it was concluded that a substantial reduction of immediate and potentially available phosphorus will tend to reduce planktonic algal growth in Lake Ontario. It is suggested that immediate steps should be taken to provide advanced waste treatment removal of phosphorus from all major domestic wastewater sources entering the lake and its tributaries. (Chilton-ORNL)
W78-07189

CRANKCASE OILS: ARE THEY A MAJOR MUTAGENIC BURDEN IN THE AQUATIC ENVIRONMENT,
Fisheries and Marine Service, St. John's (Newfoundland). Biological Station.
For primary bibliographic entry see Field 5B.
W78-07190

THERMAL EFFECTS ON FISH ECOLOGY,
Oak Ridge National Lab., TN. Environmental Sciences Div.
C. C. Coutant.
In: Encyclopedia of Environmental Engineering, Vol 2, 1976. W. & G. Baird, Ltd., Northern Ireland. p 891-896 3 fig, 24 ref.

Descriptors: *Environmental effects, *Thermal pollution, *Water pollution effects, Temperature, Fish, Ecology.

A general review of the present knowledge of the thermal effects on fish ecology is presented which includes information on temperature as a lethal agent, as a stressing factor, as a controling factor, as a limiting factor, as a masking factor, as a directing agent. It was concluded that temperature is probably the preeminent master factor in the lives of fish and that no study of fish ecology would be meaningful without consideration of thermal relationships. It is said that while, within limits, fish possess effective mechanisms for adapting to thermal changes, man must be careful not to exceed these limits if he wishes to preserve a productive commercial and recreational fishery. (Chilton-ORNL)
W78-07191

HYGIENIC EVALUATION OF FARM CROPS IRRIGATED WITH EFFLUENTS OF COAL-TAR CHEMICAL PLANTS (IN RUSSIAN),
Kiev Inst. of Nutritional Hygiene (USSR).
L. R. Polishchuk, I. N. Matvienko, and N. M. Baravanova.
Gig Sanit 1, p 34-38, 1977.

Descriptors: Industrial wastes, Coal-tar effluents, Plant growth, Growth rates, Irrigation, Waste water disposal, Calcium, Corn(Field), Fats, Iron, Potassium, Potatos, Starch, Vitamin C.

Chemical composition of coal-tar effluents were presented. Dilutions of 1:4 produced depressing effects on plant growth. Irrigation of corn with dilutions of 1:8 did not cause accumulations of 3,4-benzopyrene in potatoes with a decrease in mineral content of 10-17%. Indices of chemical composition were studied including starch, vitamin C, fat, K, Ca and Fe. The level of fats in corn dropped 29%. The 1:8 dilutions of coal-tar effluents may be used for corn irrigation.--Copyright 1978, Biological Abstracts, Inc.
W78-07194

DIATOM FLORA IN A EUTROPHIC POND IN BRITTANY: JUGON POND: AUTOECOLOGY OF A FEW SPECIES (IN FRENCH),
Institut Comportement et Environment, Rennes (France). Lab. Hydrobiology.
R. Le Cohu.
Ann Hydrobiol 8(1), p 1-26, 1977.

Descriptors: *Diatoms, *Eutrophication, Ponds, Jugon Pond(Brittany), France, Seasonal, Water pollution effects, Centrales, Cocconeis-placentula, Cyclotella-memeghiniana, Cymbella, Fragilaria, Littoral, Melosira, Pennales, Synedra-ulna.

The diatom flora of an eutrophic pond in Brittany is described; 179 spp. and 58 varieties were identified (11 Centrales, 168 Pennales). Samples were collected monthly from 3 stations (1 in open water, the other 2 littora); the variations of the diatom community were studied in the different seasons. In open water Melosira italica and M. granulata were dominant. The diatom flora generally shows a higher diversity on the littoral than in open water; some species can be found in abundance at the same time. The Nygaards photoplankton quotient and the Stockners ration were used. The validity of the results is discussed. The autoecology was examined for the following species: Achnanthes hungarica, A. lanceolata, A. minutissima, Cocconeis placentula, Cyclotella meneghiniana, Cymbella cistula, C. prostata, C. ventricosa, Fragilaria bidens, F. capucina, F. crotonensis, Melosira granulata, M. italica, M. varians and Synedra ulna. Some of these may be used (at least in Brittany) as eutrophic indicators.--Copyright 1978, Biological Abstracts, Inc.
W78-07195

HYGIENIC CHARACTERISTICS OF A NEW FLOCCULATION AGENT POLYETHYLENIMINE AND ITS STANDARDIZATION IN BODIES OF WATER (IN RUSSIAN),
Moskoviskii Gosudarstvennyi Meditsinskii Inst. (I) (USSR). Dept. of Public Hygiene.
A. S. Kinzirskii.
Gig Sanit 7, p 19-23, 1976.

Descriptors: Public health, Lethal limit, Water quality standards, Cations, Toxicity, *Flocculation agents, *Polyethylenimine.

Experiments on mice, rats and guinea pigs showed the maximum permissible concentration of cationic flocculation agent polyethylenimine was 0.1 mg/l. The limiting index of noxiousness is sanitary-toxicologic.--Copyright 1978, Biological Abstracts, Inc.
W78-07196

VIRULENCE OF CULTURES OF SALMONELLA TYPHI AND SALMONELLA PARATYPHI B FROM SEWAGE AND SOIL (IN RUSSIAN),
Uzbekskii Nauchno-Issledovatelskii Inst. Sanitarii, Gigieny i Profzabolevanii, Tashkent (USSR).
L. E. Ergasheva, and L. A. Savitskaya.
Gig Sanit 1, p 110-111, 1977.

Descriptors: *Salmonella, Sewage, Culture, *Pathogenic bacteria, *Bacteria.

Virulence of S. paratyphi B for white mice was 2.7-3 times greater than that of S. typhi. Virulence of S. paratyphi B from soil was greater than that of samples from sewage. Virulence of these organisms decreased with prolonged exposure to their natural environment. Growth and reproduction of Salmonella in the liquid phase of the tissue culture was good but the development of pathogenic action on tissue cells was different. Virulent bacteria produced cytopathogenic effects sooner (24-28 h) than weakly virulent strains. Saprophytic strains (controls) did not produce changes in tissue cells.--Copyright 1978, Biological Abstracts, Inc.
W78-07197

5D. Waste Treatment Processes

FEDERAL GUIDELINES: STATE AND LOCAL PRETREATMENT PROGRAMS, MCD-43, (3 VOLS).
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.
For primary bibliographic entry see Field 5G.
W78-06704

FERMENTATION--LESS DEGRADING FOR PROBLEM EFFLUENT TREATMENT,
H. Mueller, K. Jarl, H. Skomann, and M. Mueller.
Environmental Protection Survey, p 17-19, February, 1977. 4 fig, 2 tab, 2 ref.

Descriptors: *Food processing industry, *Fermentation, *Industrial wastes, *Recycling, *Microorganisms, Hydrolysis, Biological treatment, Biochemical oxygen demand, Waste water treatment.

Several different bioconversion processes are discussed as alternatives to biodegradation for the treatment of highly loaded effluents from the food processing industry. Fermentation is used in achieving the goals of this method, which are to reduce the BOD and to form a biomass, such as fodder yeast, having by-product value. Continuous rather than batch operation of the fermenter is the more sophisticated mode; down-times for filling and emptying are eliminated, and an equilibrium state can be reached, providing the best conditions for microorganisms growth. One plant converts potato treatment plant effluent containing up to 3% of soluble and suspended starch into a single cell protein for human consumption by using a symbiotic process between two microorganisms, Candida utilis and Endomycopsis fibuliger. Cheese whey can be converted by fermentation or ultrafiltration into lacto-proteins, and at the same time 90 to 95% of the BOD can be removed. To further increase BOD reduction, the Fermix process can be applied. This uses low-grade cereal starch to enzymatically hydrolyze whey. The substrate of lactose, glucose, whey, and cereal proteins is then fermented and spray-dried, yielding a protein-rich product appropriate as a milk food additive. Another bioconversion process is being developed to treat the cellulosic waste from rice, wheat, cotton, and sugar cane. After undergoing chemical hydrolysis and fermentation, a fibrous substance is produced which is easily digested by ruminants, and which can replace grass and hay. Although bioconversion is often very promising, in manufacturing alcohol, sugar, and baker's yeast, biodegradation is still the more suitable treatment method because of high organic loads in the wastes. Treatment methods for these waters are described. (Kutcher-FIRL)
W78-06705

THE REDOX POTENTIAL OF ACTIVATED SLUDGE,
Northumbrian Water Authority, Gostorth (England).
M. G. Burrows.
Journal of the Institute of Water Pollution Control, Vol. 76, No. 4, p 415-422, 1977. 6 fig, 3 tab, 3 ref.

Descriptors: *Oxidation-reduction potential, *Electrodes, *Activated sludge, *Laboratory tests, *Biological treatment, Waste water treatment, Treatment facilities, Nitrification, Municipal wastes.

The redox potential of activated sludge was examined under laboratory and full-scale conditions using a platinum electrode with a Ag/AgCl2 reference electrode, a pH meter, and a recorder. Samples collected during three cycles were monitored for EH, BOD, ammonia-nitrogen, nitrite, nitrate, dissolved oxygen, mixed liquor suspended solids, and pH. The rate of change of the sludge redox potential during aeratuion was directly related to the concentration of mixed liquor suspended solids and the rate of aeration of the activated sludge. The redox potential increased further with the preconditioning of the sludge through aeration cycles. The establishment of nitrification was also found to result in an increase in the plateau level of the redox potential. A higher potential was considered better for activated sludge processes. Redox potentials were monitored at an activated sludge facility which was subject to variations in loading and at a diffused air activated sludge treatment plant which produced a 30:20 standard effluent. It was discovered that redox potential was related to loading variations, with a 12-hour delayed effect. Low quality effluent was produced at lower redox potentials, while a higher redox potential enhanced nitrification. (Lisk-FIRL)
W78-06706

WATER RECLAMATION AND RECYCLING,
South West Water Authority (England).
M. D. Kavanagh.
Chartered Municipal Engineer, Vol. 105, No. 1, p 7-14, January, 1978. 6 fig, 5 tab, 9 ref.

Descriptors: *Recycling, *Reclaimed water, *Recirculated water, *Potable water, *Waste treatment, Waste water disposal, Reclamation, Industrial wastes, Water allocation(Policy), Treatment facilities, River basins, Municipal wastes.

Water recycling and reclamation practices are reviewed for municipal and industrial wastes and water supplies. A study of the River Exe in England revealed that the river's water was reused three times through removal for municipal water supplies and discharge from treatment plants. A study of the River Exe in England revealed that the river's water was reused three times through removal for municipal water supplies and discharge from treatment plants. A total of 92,901 cu m was removed and 70,038 cu m discharged daily as indicated by licensed uses of the River Exe. Fifty sewage treatment plants are located within the River Exe basin. Research and methods for the recycling of sewage for potable water supplies are discussed. Industrial plants have the option of treating their own wastes or discharging them to municipal or regional waste treatment plants. The latter alternative involves a surcharge tax for discharge or a contribution to treatment plant construction and operation, eliminating discarge costs. In-plant industrial treatment processes were examined at a cement company which recovers materials from its concrete mixer, using recycled water at a significant savings. The reuse of municipal sewage for industrial cooling was cites for electrical powerplants, steel manufacturers, gas production, and food processing industries. (Lisk-FIRL)
W78-06707

ROTATING BIOLOGICAL CONTACTORS TREAT ISLAND'S SALINE SEWAGE,
Rhode Island Univ. Kingston. Dept. of Environmental Engineering.
C. P. Poon, and W. J. Mikucki.
Water and Sewage Works, Vol. 125, No. 2, p 62-66, February, 1978. 5 fig, 4 tab, 10 ref.

Descriptors: *Biological treatment, *Trickling filters, *Saline water, *Biochemical oxygen demand, *Suspended solids, Pilot plants, Nitrogen, Phosphorus, Chlorides, Treatment facilities, Waste water treatment, Municipal wastes.

The performance of a compact, low power biological contactor that functions as both an activated sludge reactor and a trickling filter for the South Pacific island of Kwajalein was simulated in pilot studies at the University of Rhode Island. The highly saline Kwajalein sewage effluent was monitored for BOD, chloride, total and volatile suspended solids, nitrogen, and phosphorus. Organic overloading could be controlled by recirculation of 50% of the effluent to reduce BOD and prevent trickling filter failure. Recirculation was effective at organic loadings exceeding 3.3-4.0 lbs BOD/1000 sq ft/day. Low mixed liquor suspended solid levels ranging 100-215 mg/liter with a hydraulic contact time of 1-3 hrs, allowed both the activated sludge and trickling filter processes to function. A decrease in biooxidation by the filter during intense storms could be counteracted by increasing the mixed liquor suspended solids concentration to 2,000 mg/liter. Higher hydraulic loadings were effective with low BOD effluent. Removal of 50% of the nitrogen from the effluent was realized for a sewage nitrogen concentration of 4.5 mg/liter. (Lisk-FIRL)
W78-06708

WASTE TREATMENT, (ETC).
Canadian Chemical Processing, Vol. 61, No. 11, p 4-5, 1977.

Descriptors: *Oxidation, *Aeration, Equipment, *Design data, *Organic wastes, Municipal wastes, Microorganisms, Oxygen, Treatment facilities, Waste water treatment.

Rapid changes occurring in waste treatment due to the use of new reactor designs are cited. The new reactors are more compact than conventional oxidation tanks and are better suited for handling waste during cold weather. A recent development is the Oxitron process which uses the upward flow of effluent through a sand bed to fluidize the sand. Bacteria coating each grain of sand metabolize wastes in the stream. Pure oxygen is injected into the solution. The Oxitron reactor occupies 10-20% of the land area required for conventional aeration tank designs. Another compact waste treatment system the Wetox process, a wet-air oxidation process which decomposes organics in the waste stream. For small plants, requiring less than 20 mg oxygen per day, a pressure-swing adsorption system is economical. Large plants can use less expensive, cryogenic air separation. New technology and regulations on sludge utilization and disposal will be reviewed in a seminar being sponsored by Environment Canada and the Ontario Minstry of the Environment to be held Toronto in Feburary 1978. (Baker-FIRL)
W78-06709

DIGGING DEEP TO TREAT DOMESTIC SEWAGE,
J. C. Ousby, J. Walker, and R. T. Jones.
Process Engineering, p 81-84, September, 1977. 3 fig, 6 tab, 6 ref.

Descriptors: *Sludge treatment, *Dewatering, *Biochemical oxygen demand, *Chemical oxygen demand, *Suspended solids, Pilot plants, Domestic wastes, Waste water treatment, Sludge disposal, Separation techniques.

The ICI deep shaft, activated sludge treatment process increases oxygen transfer intensity and effectively reduces BOD. The single cell protein fermentation process was modified to allow longer bubbling times at a greater height or depth, resulting in the higher oxygen transfer intensity and a lower power use. The average BOD, COD, and suspended solids removal with a 100-m shaft depth was monitored at a pilot plant over a period of 194 days. BOD was reduced from 182 mg/liter t 7 mg/liter; COD decreased from 317 mg/liter to 83 mg/liter; and suspended solids dropped from 222 mg/liter to 18 mg/liter. The total removal of BOD was 92%. A three-month study of sludge production from conversion of BOD demonstrated that one kg of BOD was converted to 0.5 kg of sludge, suggesting an effective reduction in sludge production. Dewatering characteristics of the sludge were also found to improve with the deep shaft process. A pressed cake containing 38% solids was produced after 4 hours of filtration at 100 pounds/square inch; a cake containing 30% solids was achieved at the same pressure after 2 hours pressing time. (Lisk-FIRL)
W78-06710

A STUDY ON WATER POLLUTION CONTROL IN WATER SUPPLY SYSTEMS--BACKFLOW PREVENTER IN WATER SUPPLY SYSTEMS (KYUSUI SETSUBI NI OKERU JOSUI OSEN BOSHI NI KANSURU KENKYU),
T. Egawa.
Fukui kogyo daigaku kenkyu kiyo, (Memoirs of the Fukui Inst. of Technology) No 7, p 59-71, 1977. 11 fig, 4 tab, 8 ref.

Descriptors: *Water supply, *Waste disposal, *Plumbing, *Equipment, *Sanitary engineering, Environmental sanitation, Sewerage, Sewage disposal, Waste water treatment.

Prevention of backflow into water supply systems from sanitation facilities is discussed. Backflow of water from sanitation facilities presents a serious threat to water supply systems. Pollution of water supplies can be restricted or eliminated by the use of air gaps or backflow preventers. Air gaps tend to be impractical in areas of limited space, such as closet flush pipes. In such areas of restricted space, the installation of backflow preventers is recommended. The backflow preventer allows air to circulate through the interior openings in the water supply system from the exterior openings of the fixtures. Experiments on the function of backflow preventers produced in Japan are discussed. (Lisk-FIRL)
W78-06711

ASPECTS OF LAND-TREATED WASTE APPLICATIONS IN LOUISIANA WETLANDS,
Louisiana State Univ., Baton Rouge. Dept. of Marine Sciences.
R. E. Turner, J. W. Day, Jr., M. Meo, P. M. Payonk, and J. H. Stone.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 546, Price codes: A02 in paper copy, A01 in microfiche. Report No. LSU-R-76-055, May, 1976. In: Proceedings of the National Symposium on Freshwater Wetlands and Sewage Effluent Disposal, Ann Arbor, Mich., p 147-167. 2 fig, 8 tab, 18 ref. OWRT A-033-LA(3); SG No. 04-3-158-19.

Descriptors: *Overland flow, *Land management, *Louisiana, *Water reuse, *Coastal marshes, *Wetlands, Marshes, Phosphorus, Nitrogen, Carbon, Spoil banks, Waste disposal, Waste water disposal, Plant growth, Plant tissues, Soil microbiology, *Land treated waste applications, Direct application, Soil-plant systems, Fishing wastes, Topical application, Stick water, Bail water, Menhaden, Heterotrophic microbial biomass, Proteolytic activity, Ammonia-N, Nitrates, Nitrites, Total organic carbon, Dissolved organic carbon.

A short-term feasibility study was conducted in a South Louisiana coastal marsh to investigate disposal of wastes produced by menhaden fish processors by topical (direct) application and overland flow application. Experimental and control above-ground plant material were analyzed after application for biomass and nutrients (including Total Organic Carbon, Dissolved Organic Carbon, ammonia-N, nitrate-nitrite-N, total-N and phosphorus); microbial numbers were measured in soil samples. Data are presented in tabular form and indicate that overland flow application of wastes generally increases plant production. Overland flow removed an average of 40 to 50% of the nutrients; nitrogen and phosphorus levels in treated plant materials increased by 47% and 13%, respectively, over control plants. System performance and cost estimates are included. (Seip-IPA)
W78-06744

SWINE WASTE NUTRIENT RECOVERY SYSTEM BASED ON THE USE OF THERMAL DISCHARGES,
Oregon State Univ., Corvallis. Dept. of Agricultural Engineering.
J. R. Miner, L. Boersma, J. E. Oldfield, and H. K. Phinney.
In: Managing Livestock Wastes, ASAE Publication PROC-275, Proceedings of the 3rd International Symposium on Livestock Wastes held at the University of Illinois, Urbana-Champaign, April 21-24, 1975, p. 160-163. 4 fig, 3 tab, 4 ref. OWRT B-039-ORE(6), NSF GI-43681.

Descriptors: *Hogs, *Nutrient recovery, *Recycling, *Waste disposal, Livestock, Nutrients, *Farm wastes, Thermal powerplants, Heat, Slurries, Methane, Conservation, Solid wastes, Beneficial use, Algae, Chlorella vulgaris.

A swine manure nutrient recovery system using waste heat from a thermal power plant produced consistently high yields of dry matter and protein. Mean dry matter yield of all experiments was equal to a production rate of 121.5 tons/ha/year. This corresponds to yields of 55 tons of crude protein/ha/year and 47.6 tons/ha/year of total amino acids. Developed at Oregon State University, the facility is a recirculating hydraulic manure transport system in which the solids are anaerobically digested for methane recovery and nutrient release, and algae are used to capture soluble plant nutrients. Maure regularly is flushed from six pens with discharge from an overhead sophon tank; the pens hold about 50 finishing hogs. A gutter with a 1% slope carries the slurry to a pump pit and into a rotating flighted cylinder for solid-liquid separation. Following separation, the solids-rich stream drops into an anaerobic digester, and liquid from the separator, combined with effluent from the digester, is pumped to the algal growth basins. Effluent from the growth basins is centrifuged; algae are harvested and the liquid is pumped to the flush tanks for reuse. Organic matter in the untreated swine waste appeared to provide some carbon dioxide for the algae (Chlorella vulgaris). Total nitrogen content of the waste was reduced by 90% by the algae, and nitrate was less than one mg/l in the outflow. (Lynch-Wisconsin)
W78-06745

SOIL TEMPERATURE INCREASES INDUCED BY SUBSURFACE LINE HEAT SOURCES,
Long Island Vegetable Research Farm, Riverhead, NY.
For primary bibliographic entry see Field 5B.
W78-06748

AUTOMATIC CONTROL STRATEGIES FOR URBAN STORMWATER,
Northern Arizona Univ., Flagstaff. Dept. of Civil Engineering.
P. D. Trotta, J. W. Labadie, and N. S. Grigg.
Journal of the Hydraulics Division, Proceedings of ASCE, Vol. 103, No. HY12, p 1443-1459, December, 1977. 5 fig, 4 tab, 22 ref. OWRT B-113-COLO(12).

Descriptors: *Automatic control, *Control systems, *Flood control, *Treatment facilities, *Urban runoff, Stochastic processes, Storm water, Overflow, Municipal wastes, Sewage treatment, Waste water treatment.

The efficiencies of automatic control strategies for sewage treatment plants were compared under simulated storm conditions. The control methods were analyzed using the San Francisco Master Plan as the treatment plant case study. Reactive control, adaptive control with linmited forecast or with quadratic objective, and stochastic adaptive control with quadratic objective or with linear objective were compared according to their ability to predict strom water quantity and quality and to control overflow. Storm water inflows to subbasins, calculated over 20-min intervals for 3-1/3 hrs of the simulated storms' duration, ranged 1-1,500 cu ft/sec. The results of the simulation showed that a certain degree of storm prediction by control strategies was necessary for overflow control. Reactive control was the least effective system for the prevention of overflow tested, while adaptive control with limited forecast proved to be the safest. When the risk of forecast errors in the other three control strategies was taken into consideration, limited forecast provided better results because of the high degree of forecast error associated with stochastic adaptive control with linear objective. Stochastic adaptive control with quadratic objective proved effective even with a high degree of error in prediction. A hierarchical algorithm was designed for an automatic control system. (See also W77-09207; W77-07100 and W76-02878) (Lisk-FIRL)
W78-06749

INVESTIGATION OF EFFLUENT FILTERING SYSTEMS FOR DREDGED MATERIAL CONTAINMENT FACILITIES,
Northwestern Univ., Evanston, IL. Dept. of Civil Engineering.
R. J. Krizek, J. A. FitzPatrick, and D. K. Atmatzidis.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A031 468, Price codes: A11 in paper copy, A01 in microfiche. Contract Report No. D-76-8, August, 1976. 155 p, 46 fig, 32 tab, 102 ref, 4 append. DACW39-74-C-0090.

Descriptors: *Filtration, *Confined water, *Dredging, *Waste water treatment, *Separation techniques, Adsorption, Dikes, Effluents, *Dredged material containment, *Granular media, *Solid-liquid separation, Pervious dikes, Sand fill weirs, Granular media cartridges.

The functional capabilities and performance characteristics of effluent filtering systems were investigated and guidance regarding the design of filtering systems to improve the quality of effluent from dredged material containment facilities is provided. About 300 laboratory and field tests (on vacuum filtration and the use of granular filter media, fibrous filter media, and unconventional filter materials) were conducted and used to develop new concepts for the design of non-mechanized granular media filter systems (pervious dikes, sand fill weirs with or without backwash, and granular media cartridges). Each new system has a specific applicability with respect to the concentration of suspended solids in the effluent. Guidelines for the application of conventional solid-liquid separation technology to the design of dredged material confinement facilities are summarized. Classical sedimentation basin theories were adapted and nomographs were prepared to estimate the amount and gradation of suspended solids in the effluents when the geometry of the area, flow rate, and the pertinent characteristics of the dredged material slurry are known. (Seip-IPA)
W78-06757

PRELIMINARY DESIGN OF A HOUSEHOLD REFUSE GRINDER,
Foster-Miller Associates, Inc., Waltham, MA.
A. T. Fisk, and A. R. Guzdar.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 503, Price codes: A07 in paper copy, A01 in microfiche. Report to Environmental Protection Agency, Cincinnati, Ohio, Solid Waste Research Laboratory, January 19, 1973. 124 p, 22 fig, 10 tab, 11 ref, 1 append. CPE-70-115.

Descriptors: *Domestic wastes, *Waste disposal, Design data, Cost analysis, Waste water treatment, *Household wastes, *Grinding, *Household refuse grinder.

A preliminary design for a single family household refuse grinder was developed as part of an overall study to evaluate the technical feasibility of transporting ground household refuse through existing sewers. The grinder reduces most of the components of household refuse into a slurry formed with the non-fecal component of household water and transports it through the house sewer lateral to the sewer where it is mixed with the rest of the water. The system requires a modification in household plumbing and a storage tank to separate and store the non-fecal component of waste water. The grinder would be capable of grinding most of the components of household refuse, i.e., paper, cardboard, plastics, cloth, glass, lightweight aluminum, and garbage; it would accept (but would not grind) heavy aluminum and steel cans without damage to the machine, clean the cans of putrescible matter, and probably crumble them to a smaller volume. Simplicity of design, jam-free operation, and low cost were achieved within the maximum power limitations of available electrical household service. Typical estimated costs are: (1) $780 for the grinder and water supply system, (2)$200-$500 for the modification of new construction, and (3) $500-1200 for the modification of existing homes. The annual cost of the system, including depreciation and maintenance, is estimated to be in the range of $70-115. (Seip-IPA)
W78-06758

ECONOMIC IMPACT OF PROPOSED AMENDMENTS TO MERCURY EFFLUENT STANDARDS IN ILLINOIS (R 76-17) (R 76-21),
Southern Illinois Univ. at Carbondale.
For primary bibliographic entry see Field 5G.
W78-06759

COSTS OF WASTEWATER TREATMENT BY LAND APPLICATION, MCD-10,
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.
C. E. Pound, R. W. Crites, and D. A. Griffes.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 439, Price codes: A08 in paper copy, A01 in microfiche. Report No EPA-430/9-75-003, June, 1975. 156 p, 41 fig, 15 tab, 61 ref, 7 append. 68-01-0966.

Descriptors: *Land use, *Waste water treatment, *Economics, Cost-benefit analysis, Costs, Irrigation, Surface irrigation, Infiltration-percolation, Overland flow, Cost-effectiveness.

Preliminary cost screening is discussed and detailed cost estimates are presented for alternative land application systems for wastewater treatment. Cost categories include land, preapplication treatment, transmission, storage, land application, and recovey of renovated water. For preliminary screening costs, curves are presented relating capital, amortized, and operation and maintenance costs to average flow rates. Cost calculation procedures and an illustrative example are in-

cluded. For detailed planning costs, curves, tables, and data are presented for 33 individual cost components related to either flowrate or field area. For capital items, total construction costs are shown, and operation and maintenance costs are divided into labor, materials, and power, where applicable. The appendices contain: (1) information on revenue-producing and non-revenue producing benefits; (2) references; (3) sewage treatment plant and sewer construction cost indexes; (4) present worth and capital recovery factors; (5) cost-effectiveness analysis guidelines; and (6) a glossary of terms, abbreviations, and English-metric conversion factors. (Wares-IPA)
W78-06760

HANDBOOK FOR SEWER SYSTEM EVALUATION AND REHABILITATION, MCD-19,
Environmental Protection Agency, Washington, DC. Municipal Construction Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 457, Price codes: A10 in paper copy, A01 in microfiche. Report No. EPA - 430/9-75-021, December, 1975. 218 p, 47 fig, 26 tab, 17 ref, 4 append.

Descriptors: *Infiltration, *Inflow, *Sewers, *Water quality standards, Evaluation, *Rehabilitation, Inspection analysis, Water pollution control, *Infiltration inflow, *Federal Water Pollution Control Act Amendments.

The methodology necessary for an effective investigation and subsequent correction of Infiltration/Inflow (I/I) conditions in a sewer system is described in a handbook, which provides assistance in the preparation and review of I/I Analyses and Sewer System Evaluation Surveys. Chapters on: (1) methodology for conducting I/I analysis; (2) methodology for conducting Sewer System Evaluation Survey; (3) information on current state-of-the-art techniques for sewer rehabilitation; (4) costs associated with conducting Sewer System Evaluaton Survey and rehabilitation; and (5) how to utilize this guide are included. Each specific task that may be required in conducting I/I analysis and Sewer System Evaluation Survey explained in detail. A set of cost curves indicates the correlation between the cost for each phase of sewer system evaluation work and variables such as sewer length, population, and magnitude of I/I. (Seip - IPA)
W78-06761

COOLING TOWERS: A BIBLIOGRAPHY (JUNE 1977 - DECEMBER 1977).
Department of Energy, Oak Ridge, TN. Environmental Sciences Information Center.
For primary bibliographic entry see Field 5G.
W78-06763

ALTERNATIVE WASTE MANAGEMENT TECHNIQUES FOR BEST PRACTICABLE WASTE TREATMENT, MCD-13.
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.
For primary bibliographic entry see Field 5G.
W78-06765

BEHAVIOR OF WASTEWATER SLUDGES AND CHEMICAL WASTEWATER SLUDGES DURING AEROBIC DIGESTION,
Toronto Univ. (Ontario).
M. F. Hamoda.
Available from University Microfilms International, Ann Arbor, Michigan 48106. PhD Thesis, 1975.

Descriptors: *Activated sludge, *Aerobic treatment, *Sludge digestion, *Ammonium, *Alum, Lime, Chemical precipitation, Volatility, Iron, Dewatering, Filtration, Physical properties, Phosphorus, Waste water treatment.

Aerobic digestion of chemically-treated activated, primary, and precipitated sludges was evaluated in labortory experiments with alum, ferric chloride, and calcium hydroxide. Doses of 200-600 mg/liter of calcium hydroxide, 8.1-22.3 mg/liter of alum, or 10-30 mg/liter of ferric chloride were added to five types of sludge originating from primary treatment, activated sludge, lime treatment, and mixed liquor treatment with alum or ferric chloride. The primary and activated sludges were employed as the controls in the batch and semi-continuous aerobic digestion systems. Sludges treated in semi-continuous digestors had a higher supernatant quality, dewaterability and oxygen uptake rate. A linear correlation existed between the decomposition rate constant for volatile suspended solids reduction and the initial volatile suspended solids concentration in batch digestion systems. For lime primary sludge, a linear relationship was found between the decomposition constant and alkalinity during digestion. Nitrification decreased in sludges treated with high lime dosages; settling and filtration improved after aerobic digestion for 10-12 days. Soluble phosphorus was released from the lime primary sludge after storage for 15 days at 20C. Aerobically-digested alum or ferric chloride activated sludge required storage for up to 10-15 days and exhibited poor settling and filtration properties. Control activated sludges were unaffected by aluminum or ferric additions during aerobic digestion and displayed lower oxygen uptake rates than primary sludges. (Lisk-FIRL)
W78-06785

VIRAL MONITORING OF WASTEWATER AEROSOLS,
Michigan Univ., Ann Arbor, Dept. of Epidemiology.
For primary bibliographic entry see Field 5A.
W78-06806

RESEARCH NEEDS RELATING TO ON-SITE TREATMENT OF DOMESTIC WASTES.
Maine Univ. at Orono. Land and Water Resources Inst.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 989, Price codes: A02 in paper copy, A01 in microfiche. A Workshop Sponsored by Northeast Water Institute Directors and New England Council of Water Center Directors, Technical Report, (Partial Completion Report), April 1978, 14 p. OWRT B-061-RI(4). 14-31-0001-3953.

Descriptors: *Research priorities, Sewage disposal, *Sewage treatment, *Waste water treatment, *Domestic wastes, *On-site sewage systems.

There has been a dispersal of urban populations in the U.S. into rural areas outside older cities and towns. This dispersal has been accompanied by widespread use of private on-site sewage systems. Initially, the proliferation of such systems caught state and local governments off guard. Many early systems were poorly designed and poorly constructed. Some private wells became contaminated, and threats became apparent to lakes, streams, and other water resources. In response, laws and regulations were adopted, mostly through state governments, intended to guarantee proper design and installation of on-site systems. To a large extent, however, these laws and regulations were not reinforced by a technical mastery of how on-site systems perform. The immediate environmental effects of on-site systems have been poorly understood, as have the broader land-use effects of widespread use of such systems. This workshop brought together people knowledgeable about the situation in New England. The purpose of the workshop was to identify research needs with respect to on-site sewage disposal. Principal suggestions made during and following the workshop are summarized. Other alternative methods of sewage treatment (e.g. aerobic units) were not examined at the workshop and therefore are not covered in this summary. This report does not summarize state-of-the-art information presented at the workshop, but rather outlines areas in which knowledge should be expanded. Intended to be a step toward a comprehensive regional research program, the report is in two parts: an outline of topic areas/problems/research needs; and elaborations upon principal research needs. (Harsbrouck-Maine)
W78-06807

WASTEWATER RECYCLING: DEVELOPMENT OF MYCORRHIZAL ROOT SYSTEMS FOR INCREASED EFFICIENCY,
Michigan State Univ., East Lansing. Dept. of Botany.
For primary bibliographic entry see Field 5G.
W78-06808

EFFECTS OF WATER TREATMENT PLANT WASTES ON DOMESTIC WASTEWATER TREATMENT PROCESSES,
Auburn Univ., AL. Water Resources Research Inst.
J. M. Morgan, B. A. Rindt, J. R. Vorhees, and M. E. Burman, III.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 970, Price codes: A06 in paper copy, A01 in microfiche. OWRT A-040-ALA(1).

Descriptors: Water quality, Water treatment, Waste water treatment, *Alum sludge, Waste disposal, Waste water disposal, Clarification, Sludge digestion, Activated sludge, Dewatering.

The principal and most troublesome waste produced during ordinary domestic water treatment is alum sludge. Many methods have been suggested for the treatment and disposal of this material, but none is universally applicable. Among the more promising techniques is discharge of the sludge to a domestic sewerage system. This research was undertaken to ascertain the effects that this action would have on the receiving wastewater treatment plant. The effects of alum-water-treatment-plant sludge on primary clarification, anaerobic sludge digestion, activated sludge wastewater treatment, and the dewatering of various sludges were investigated. Results indicated that few ill effects would result from disposal of alum sludges in this manner, and that under certain conditions the performance of the wastewater treatment plant might be enhanced. Th only potentially serious adverse effect was that the total volume of sludge to be treated and disposed of at the wastewater treatment plant would increase somewhat.
W78-06811

THE APPLICABILITY OF PYROLYSIS-GAS-LIQUID CHROMATOGRAPHY FOR THE QUANTITATIVE IDENTIFICATION OF BACTERIA IN SEWAGE TREATMENT PLANT EFFLUENT,
Catholic Univ. of America, Washington, DC. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-06814

GAS-LIQUID-CELL OXYGEN ABSORPTION IN FERMENTATION,
Iowa State Univ., Ames. Engineering Research Inst.
For primary bibliographic entry see Field 5A.
W78-06824

SPIRAL-WOUND POLY(ETHER/AMIDE) THIN-FILM COMPOSITE MEMBRANE SYSTEMS,
Universal Oil Products Co., San Diego, CA. Fluid System Div.
For primary bibliographic entry see Field 3A.
W78-06829

GAS SEPARATION MEMBRANES: TECHNOLOGY AND APPLICATIONS,
Universal Oil Products, Inc., San Diego, CA. Basic Development Dept.
For primary bibliographic entry see Field 3A.
W78-06830

NITROGEN REMOVAL BY ION EXCHANGE: BIOLOGICAL REGENERATION OF CLINOPTILOLITE,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
M. J. Semmens, J. T. Wang, and A. C. Booth.
Journal Water Pollution Control Federation, Vol. 49, No. 12, p 2431-2444, December, 1977. 14 fig, 1 tab, 12 ref. OWRT A-080-ILL(2).

Descriptors: *Nitrification, *Ion exchange, *Zeolites, *Ammonium compounds, *Dissolved oxygen, Organic compounds, Nitrogen fixing bacteria, Phenols, Humic acids, Industrial wastes, Municipal wastes, Waste water treatment, *Clinoptilolite.

The regeneration of clinoptilolite, a zeolite used for removal of ammonium from waste water, by the use of nitrifying bacteria was examined. Clinoptilolite containing high concentrations of ammonium was treated with a slurry of nitrifying bacteria containing 0.3 M sodium nitrate. Biological regeneration of the zeolite during 20 tests occurred over a time range of 1.3-4.6 hrs. The rate of regeneration was found to be based on the rate of nitrification. Optimum nitrificAtion rates were achieved by the addition of pure oxygen to maintain the dissolved oxygen level above 6 mg/liter. Additions of phenol and humic acid to the regeneration process did not have deleterious effects on the nitrifying bacteria or the regeneration process. Chemical regeneration of clinoptilolite at a neutral pH with 0.3 M sodium chloride was more effective than the biological regeneration. This difference was attributed to the production of magnesium and calcium ions in the brine during the biological regeneration process. (Lisk-FIRL)
W78-06855

A SURVEY OF PRACTICES AND REGULATIONS FOR REUSE OF WATER BY GROUNDWATER RECHARGE,
SCS Engineers, Long Beach, CA.
C. J. Schmidt, E. J. Clements, and S. P. Skelton.
Journal American Water Works Association, Vol. 70, No. 3, p 140-147, March, 1978. 4 fig, 13 tab, 15 ref.

Descriptors: *Artificial recharge, *Injection wells, *Water spreading, *Waste water disposal, Ground water, Aquifers, Regulation, Legislation, Water pollution, Water quality control, Percolation, Water reuse, California, New York.

Present interest in formal, regulated wastewater reuse projects is simply bringing focus upon an informal practice which has existed for a long time. To date, ground water recharge by direct injection of wastewater is practiced at one site (Orange Co., California), under construction at another (Nassau Co., New York), and in planning stages at three. Formal ground water recharge by landspreading and percolation is practiced at six sites, five located in California. By 1976, approximately 26 states had prepared regulations and guidelines for ground water recharge; proposed U.S. EPA regulations for underground injection programs would generally allow the states to exercise maximum flexibility to prevent ground water pollution. Direct injection of treated wastewater is regulated on an individual project basis in California and New York, the two states where such systems are in use. Individual case regulation is also practiced for spreading and percolation but with less stringent requirements for the quality data for each recharge site discussed, as well as procedural details of the various operations. (Eberle-NWWA)
W78-06958

WASTEWATER TREATMENT PLANT CLEANS UP MASSACHUSETTS RIVER.
Water and Sewage Works, Vol 125, No 3, p 75, March, 1978.

Descriptors: *Rivers, *Treatment facilities, *Aeration, *Settling basins, *Chlorination, Slide gates, Sluice gates, Interceptor sewers, Flowmeters, Data collections, Incineration, Waste water treatment, Municipal wastes.

A municipal waste water treatment plant with a 52 mgd capacity was constructed to reduce the pollutant load on the Merrimack River in Massachusetts. The activated sludge treatment plant, designed by Camp, Dresser, and McKee, Inc of Boston, serves the municipalities of Lawrence, Andover, North Andover, and Methuen. Influent is pumped through a 2,800 ft long force main to the plant where it undergoes primary sedimentation and aeration. The effluent is then treated with secondary sedimentation and is chlorinated before discharge into the Merrimack River. Sludge produced during treatment is dewatered and incinerated; stack gases are scrubbed before emission into the atmosphere. The treatment plant is equipped with 8 heavy duty sluice gates, 40 aluminum slide gates, and 9 roller gates. Six of the 8 sluice gates are electrically operated. Two interceptor sewer lines, one 21,600 ft long and the other 9,400 ft long, collect the municipal wastes for transport to the facility. Flowmeters measure the input from each community for calculation of operating expenses. (Lisk-FIRL)
W78-06976

BLOWERS FOR WATER RECLAMATION WORKS.
Water Services, Vol 81, No 982, p 752, December, 1977.

Descriptors: *Aeration, *Dissolved oxygen, *Aerobic treatment, *Aerated lagoons, Design data, Equipment, Aerobic conditions, Monitoring, Automation, Air pollution, Filters, Treatment facilities, Waste water treatment, Municipal wastes.

Waste water treatment aeration units, manufactured by Hick Hargreaves, a division of Electrical and Industrial Securities Ltd, have been designated for installation in the Loughborough Water Reclamation Works in England. Two 3150 Series 1423 Blowers will be put into operation with a third maintained as a standby. The aerators will have variable capacities ranging 2,000-5,000 cu ft/min at a pressure of 6 lb/sq in-g. Dissolved oxygen concentrations in the four aeration tanks will be monitored by eight probes mounted in banks of four. Each bank is capable of operating the aerators at variable speeds, dependent upon the measured dissolved oxygen levels. The aerators will function automatically when the oxygen level deviates by 0.5 mg/liter from 2.0 mg/liter. Noise levels at speeds between 450-980 rpm will be controlled by acoustic hoods and reactive-absorptive silencers. Electrostatic dry clean precipitors will filter the air. (Lisk-FIRL)
W78-06977

SCALE-FREE-VAPOR-COMPRESSION EVAPORATION.
Office of Water Research and Technology, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 124, Price codes: A02 in paper copy, A01 in microfiche. Water Research Capsule Report, 1977. 9 p, 5 fig, 4 tab.

Descriptors: *Brines, *Waste water treatment, *Evaporation, *Desalination processes, Equipment, Design, *Technology transfer, Information exchange, *Brine concentration.

The development and applications (current and potential) of a tube-in-shell, vapor-compression evaporator (Brine Concentrator), utilizing a seed-slurry process for scale control, are described. Water is pumped through a heat exchanger (after being treated to hold acidity (pH) between 5.5 and 6.5 for decarbonating), which raises its temperature to near the boiling point. Passing through a deaerator to be stripped of carbon dioxide, nitrogen, and oxygen, the waste combines with a slurry concentrate in the evaporator sump. The slurry is constantly circulated from the sump to the top of the evaporator from which it is distributed as a falling film on the inside of the tubes. During the process, a portion of the water in the slurry film is vaporized; the vapor is then compressed and introduced to the shell side of the evaporator tubes. Due to the temperature differential between the vapor and the brine slurry film, the vapor condenses as water on the outside of the tubes; this condensation releases energy for further process evaporation. A sensing device controls the concentration in the sump and supersaturaed brine-slurry waste is continuously withdrawn for final disposal. The product water gives up its heat to the incoming waste stream in the heat exchanger and is then collected and returned for use in the power plant's process system. By using a brine concentrator, water-intensive industries can maximize water recovery and reuse without the in-process buildup of precipitated solids. Several features support the system's broad industrial application, including: water, energy, and pollution control; functional versatility; and production of high quality water. (Seip-IPA)
W78-06994

EVALUATION OF TECHNIQUES FOR ALGAE REMOVAL FROM WASTEWATER STABILIZATION PONDS, REVIEW PAPER,
Utah Water Research Lab., Logan.
E. J. Middlebrooks, D. B. Porcella, R. A. Gearheart, G. R. Marshall, and J. H. Reynolds.
Report No. PRJEW115-1, January, 1974. 20 p, 2 fig, 1 tab, 10 ref. OWRT A-015-UTAH(2), 14-31-0001-3845; and 68-03-0281.

Descriptors: *Algae, *Algal control, Evaluation, Ponds, Waste water(Pollution), Waste water treatment, Waste storage, Stabilization, Centrifugation, Coagulation, Flocculation, Filtration, Soil filters, *Algal removal, Particulates, Microstraining, Containment.

Review and evaluation of techniques for algae removal from wastewater stabilization ponds are presented. Criteria for candidate processes for removal of particulate matter (e.g., microorganisms) include ease of operation, minimum maintenance and cost, dependability of operation, and efficiency of particulate removal, including preventing recycling biological oxygen demand and nutrients from decay of particulates. Processes reviewed ae centrifugation, microstraining, coagulation-flocculation, containment, and soil filtration. The use of the soil mantle for polishing effluents is the most economically and technologically feasible method for algae removal, despite questions concerning environmental effects. Granular media filtration through soil mantles offers the advantages of automatic operation, clear effluent, low effluent biological oxygen demand, nutrient removal, and economy. (Wares-IPA)
W78-06995

RECREATIONAL REUSE OF MUNICIPAL WASTEWATER--PHASE II,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 5G.
W78-06997

FEASIBILITY OF USING IRON ORE OVERBURDEN MATERIAL AS A MEDIA FOR

DISPOSAL OF SECONDARY SEWAGE EFFLUENT IN NORTHEASTERN MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Forest Resources.
For primary bibliographic entry see Field 5E.
W78-07000

THE EFFECTS OF TEMPERATURE CONTROL ON BIOLOGICAL WASTEWATER TREATMENT PROCESSES,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
C. E. Collins, C. P. L. Grady, Jr., and F. P. Incropera.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 567, Price codes: A08 in paper copy, A01 in microfiche. Purdue University Water Resources Research Center Technical Report No. 98, March 1978. 143 p, 49 fig, 13 tab, 64 ref. OWRT A-042-IND(2).

Descriptors: *Waste water treatment, *Water temperature, *Sludge digestion, *Sludge disposal, Sludge, Sludge treatment, Activated sludge, Biodegradation, Heated water, Thermal water, Aeration.

This study is concernedf with the feasibility of using waste heat to optimize the performance of a biological wastewater treatment facility through temperature control. The effect of temperature on biological wastewater treatment was modelled by considering its influence on several important processes. In particular, the specific influence of temperature on the bacterial kinetic parameters, the oxygen transfer process and the biomass settling was included in the model. The parameters chosen to determine the effect of temperature on the system were effluent quality, mass wastage (sludge disposal) rate, and the power requirements for aeration. These parameters reflect both the primary purpose of waste treatment and the major operating costs. The parameters were determined as a function of both temperature and sludge age, since both of these variables may be used to control the operation of a wastewater treatment facility. The results of a computer simulation show that an optimal temperature for operation of a secondary wastewater treatment facility is approximately 25C. Operation at this temperature provides improved effluent quality and reduced sludge protection, without incurring an excessive increase in the power requirements for aeration.
W78-07001

BIOLOGICAL CONTROL OF WATER POLLUTION.
Pennsylvania Univ., Philadelphia. Center for Ecological Studies in Planning and Design.
University of Pennsylvania Press, 1976, 340 p, Edited by Joachim Tourbier and Robert W. Pierson, Jr.

Descriptors: *Biocontrol, *Water pollution control, *Waste water treatment, *Biological treatment, Water pollution effects, Potable water, Alternative planning, Aquifer recharge, Waste disposal.

In the conference, scientists, environmental experts, and city planners from Germany, Holland, the Sudan, Finland, Romania, the United States, and Puerto Rico discuss how biological systems may be utilized to deal with water pollution problems. Papers are presented suggesting that green plants and biological systelms have the capacity to detoxify dangerous synthetic chemicals in industrial wastes, and that vegetation can capture nutrients and be harvested directly as food for man and domestic animals or used for paper manufacture or composting. More complex systems are also presented in which food chains are reconstructed from nature, beginning with green plants and phytoplankton and ending with animals of economic value. Biological systems are discussed which rely on forest, marsh, or crop vegetation together with soil microorganisms to improve the quality of aquifer recharge water. (See W78-07004 thru W78-07012)
W78-07003

THE ROLE OF AQUATIC PLANTS IN AQUATIC ECOSYSTEMS,
Academy of Natural Sciences of Philadelphia, PA. Dept. of Limnology.
R. Patrick.
In: Biological Control of Water Pollution. Univ of Penn. Press, Inc., Philadelphia, Pa. Tourbier, J. and R. W. Pierson Jr. (editors). 1976. p 53-59. 15 ref.

Descriptors: *Aquatic plants, *Nutrient removal, *Heavy metals, *Aquatic algae, Primary production, Nickel, Manganese, Wetlands, Estuaries, Rivers, Aquatic ecosystems, Vanadium.

Aquatic plants enrich aquatic and wetland ecosystems by fixing carbon and giving off free oxygen during photosynthesis. They also provide shelter for aquatic organisms. In the growth of aquatic plants various nutrients are removed from the water. Nutrients may be accumulated in excess of what is needed for growth. Significant amounts of heavy metals are also accumulated. Nutrients and trace metals are stored in plant tissues and are returned to the aquatic ecosystem as food or detritus. In the case of emergent vegetation, they may be dispersed into the terrestrial ecosystem. Wetlands are important for the production of various substances essential for the aquatic ecosystem. An example is the production of vitamin B12 by fungi and bacteria in swamps. (See also W78-07003) (Stihler-Mass)
W78-07004

DEWATERING OF SLUDGE AT COMPACT SEWAGE TREATMENT WORKS.
Water Services, Vol 81, No 982, p 757, December, 1977.

Descriptors: *Treatment facilities, *Dewatering, *Sludge treatment, *Design data, *Activated sludge, Screens, Lime, Flocculation, Vacuum drying, Filtration, Waste water treatment, Municipal wastes.

Restricted land area in Copthorne, Sussex, England, mandated the installation of a compact, drum vacuum filter for sludge dewatering rather than drying beds which would have required a 10,000 sq ft area. The treatment system selected to serve the population of 10,000 included initial pretreatment with screening and degritting. The system contained turbine aerators with high rate circulation for activated sludge treatment; provisions were also made for aerobic treatment of sludge. A daily volume of 5,000 gal of sludge with a 98% moisture content was conditioned with lime and ferric chloride and thickened in storage tanks before filtration. The rotating drum vacuum filter with a surface area of 78 ft and a belt discharger, dewatered the sludge to 80% moisture content. Capital and maintenance costs of the system were about equal to those of drying bed-sludge treatment systems. (Lisk-FIRL)
W78-07005

ROTATING DISC SEWAGE TREATMENT SYSTEM,
Dickson Environmental Engineering Ltd., Guildford (England).
R. E. Godfree.
Water Services, Vol 81, No 982, p 748, December, 1977.

Descriptors: *Filters, *Biological membranes, *Construction materials, *Separation techniques, *Biochemical oxygen demand, Suspended solids, Filtration, Teritary treatment, Waste water treatment, Municipal wastes.

A rotating biological disc with an automatic drum filter allows higher loading rates and eliminates the need for final clarification or settlement of the municipal effluent. The biological disc is constructed of polyvinyl chloride in a continuous spiral configuration which maintains uniform contact of the sewage effluent with the rotating disc. The waste water passes by gravity flow through a filter cloth mounted on a perforated drum. The filtration process requires about 3 min, with longer times allowed for effluent with a high suspended solids content such as activated sludge. The 1.5 m and 2.0 m diameter disc packs have effective capacities of 12 g/sq m and 16 g/sq m BOD load, respectively. Under these loading conditions, the treated effluent has a BOD content of 20 mg/liter and a suspended solids level of 30 mg/liter. Higher removal rates can be achieved by the rotating disc filter with longer contact times; filter performance is dependent upon the texture of the filter cloth. The system can function as a secondary or tertiary treatment method, based upon the filter texture. (Lisk-FIRL)
W78-07006

VACUUM FILTRATION, WITH PARTICULAR REFERENCE TO OPERATIONAL AND MAINTENANCE PROBLEMS,
R. A. Mansfield.
Water Pollution Control, Vol 77, No 1, p 61, 1978.

Descriptors: *Filtration, *Vacuum drying, *Dewatering, *Sludge treatment, *Operation and Maintenance, Sludge disposal, Filters, Polyelectrolytes, Labor, Capital costs, Waste water treatment, Municipal wastes.

Problems encountered with the operation and maintenance of a vaccum filter for digested sludge dewatering at the New Germany waste water treatment facility in South Africa were discussed. The sludge, which was buried after treatment, was excessively dewatered, creating an additional 21% solids loading on the digestor. The edges of the polypropylene monofilament filter, with a 1.85 m diameter, were sealed by vulcanizing the rubber edges with heat. Fibers and other materials collected and clogged the pipelines at the check valves, the polyelectrolyte-sludge mixing unit, and the spray nozzles. Sand and grit caused excessive pump water; the dosing pumps in the polyelectrolyte make-up tank were obsructed by insects entering the tank. An overhead gantry was required for repairs; the use of reclaimed effluent required pump, blower, and chlorinator housings. (Lisk-FIRL)
W78-07007

APPLICATION OF VASCULAR AQUATIC PLANTS FOR POLLUTION REMOVAL, ENERGY, AND FOOD PRODUCTION IN A BIOLOGICAL SYSTEM,
National Aeronautics and Space Administration, Bay Saint Louis, MS. National Space Technology Labs.
B. C. Wolverton, R. M. Barlow, and R. C. McDonald.
In: Biological control of water pollution, Univ. of Penn. Press, Inc., Philadelphia, Pa., Toubier, J. and Pierson, R. W., Jr. (Editors). 1976. p 141-149. 5 fig, 3 tab, 18 ref.

Descriptors: *Vascular plants, *Water hyacinths, *Nutrient removal, Heavy metals, Wetlands, Water pollution, Alligator weed, Sewage effluents, Waste water, Primary production, Nitrogen, Phosphorus, Phenol, Food production, Biogas production.

A one-acre (0.40 ha) water hyacinth wetland has the potential for removing over 3500 pounds of nitrogen and over 800 pounds of phosphorus annually from sewage effluent, absorbing and metabolizing over 150 pounds of phenol every 72 hours from phenol-polluted water, and removing over 120 gm of trace heavy metals daily. Under

favorable conditions, one acre of wter hyacinth has the potential of producing over 70 tons of dry plant material annually. This can be converted, through anaerobic decomposition, to over one million cubic feet of biogas; A high grade fertilizer is produced as a by-product. Water hyacinths may, eventually, be used as food for cattle and even man. Field demonstrations using a chemical waste lagoon and a municipal sewage lagoon are in process. Processing equipment, including scaled-up laboratory models of biogas generating units, is being developed. (See also W78-07003) (Stihler-Mass)
W78-07008

SEWER JET CLEANER THAWS WATER MAINS.
For primary bibliographic entry see Field 8G.
W78-07009

THE POTENTIAL USE OF FRESHWATER TIDAL MARSHES IN THE MANAGEMENT OF WATER QUALITY IN THE DELAWARE RIVER,
Rider Coll., Trenton, NJ. Dept. of Biology.
D. F. Whigham, and R. L. Simpson.
In: Biological Control of Water Pollution. Univ. of Penn. Press, Inc., Philadelphia, Pa., Tourbier, J. and Pierson, R.W., Jr. (Editors). 1976. p 173-186. 8 fig, 3 tab, 21 ref.

Descriptors: *Water quality, *Biological treatment, *Delaware River, Wetlands, Primary productivity, Soil algae, Nitrogen, Phosphorus, Dissolved oxygen, Carbon dioxide, *Freshwater tidal marshes, Hamilton Marsh, Aboveground production, Nutrient sink, Phizoclonium.

Freshwater tidal marshes, which make up 5% of the marshland in the Delaware River estuarine system, may be of use in the management of the water quality of that river. Hamilton Marsh, the northernmost tidal marsh in the Delaware River basin, can be divided into four habitats: 1. streams and stream banks, 2. high marsh, 3. pondlike areas drained only at low tide, and 4. continuously flooded areas. Seven vegetation types, as measured by harvesting on 0.25 sq m quadrats, varied from 6.5 t/ha/yr to 21.0 t/ha/yr. Mixed vegetation, the most expansive type, averaged 9.1 t/ha/yr. Freshwater tidal marshes are as productive as estuarine saltmarshes. Average nitrogen content for all species in the mixed type was 2.49%. Peat biomass of edaphic algae, the only functioning producers during eight months of the year, was 37.7 kg/ha. Graphs illustrate changes in water quality parameters between June 1974 and January 1975. Data suggest that high marsh areas act as a nutrient sink during summer months and that pond-like areas may serve a similar function during winter. (See also W78-07003) (Stihler-Mass)
W78-07010

AQUACULTURE AS AN ALTERNATIVE WASTEWATER TREATMENT SYSTEM,
Oklahoma State Dept. of Health, Oklahoma City.
R. L. Carpenter, M. S. Coleman, and R. Jarman.
In: Biological Control of Water Pollution. Univ. of Pennsylvania Press, Inc., Philadelphia, Pa., Tourbier, J. and Pierson, R. W., Jr. (Editors). 1976. p 215-224, 5 fig, 1 tab, 26 ref.

Descriptors: *Biological treatment, *Municipal wastes, *Sewage lagoons, *Waste water, Federal Water Pollution Control Act, Biochemical oxygen demand, Pathogenic bacteria, Oklahoma, Channel catfish, Tilapia, Suspended solids, Food habits, Minnows, *Aquaculture, Fecal coliforms.

The use of aquaculture to upgrade wastetreatment lagoons while producing a valuable by product is being studied in a six-cell, serially operated, experimental lagoon system. Fish were already present in the first two cells receiving conventional aerated treatment. The four non-aerated cells were variously stocked with channel catfish, golden shiners, fathead minnows, and Tilapia nilotica. The secondary treatment standard for 5-day biological oxygen demand was met in the effluent from the second cell; standards for suspended solids and fecal coliforms were met in the effluent of the fifth cell. Removal of nitrogen and phosphorus was excellent. No pathogens were found in waste water beyond the first two cells nor in any of the 179 fish sampled. Biomass increases were: 4 to 163 lbs for Tilapia nilotica; 600 to 4000 lbs for channel catfish, 85 to 535 lbs for golden shiners. When operated in the absence of fish, effluent quality was lower and the suspended solids standard was not met. (See also W78-007003) (Stihler-Mass)
W78-07011

A PROPOSED INTEGRATED BIOLOGICAL WASTEWATER TREATMENT SYSTEM,
Texas State Dept. of Health, Austin. Div. of Wastewater Technology and Surveillance.
R. Dinges.
In: Biological Control of Water Pollution. Univ. of Pennsylvania Press, Inc., Philadelphia, Pa., Tourbier, J. and Pierson, R. W., Jr. (Editors). 1976. p 225-230. 2 fig, 3 tab, 6 ref.

Descriptors: *Municipal wastes, *Biological treatment, *Nutrient uptake, *Aquatic plants, Water hyacinths, Harvesting, Zooplankton, Daphnia, pH reduction filter, Coliform reduction, Aquaculture, Glass shrimp, Asiatic clams.

The proposed system intended to correct the deficiency of stabilization pond effluent quality consists of four serially-operated treatment ponds. Stabilization pond effluent in which original organic matter has been reduced by bacterial action and converted to algal cells will be passed through a pH reduction filter and into the proposed unit. The first pond will contain water hyacinths and duckweed; scuds will be abundant. Expected results are mineral nutrient uptake, reduction of hardness and total dissolved solids, denitrification, and suppression of algal growth. Results expected of the second pond devoted to zooplankton culture are clarification, organic and coliform reduction, and mineralization and mineral nutrient uptake. The third pond will contain larger invertebrates such as glass shrimp. Expected results are biomass conversion to a larger life form, nutrient uptake, settling, and minimal organic reduction. Results of the fourth pond, which will contain fish, are biomass conversion to a larger life form, settling, and minimal organic reduction. By-product production may help offset the cost of treatment. (See also W78-07003) (Stihler-Mass)
W78-07012

PLEINS FEUX SUR LES EAUX ROUGES DE MONT-WRIGHT (RED WATER AND THE MOISIE RIVER).
Quebec Cartier Mining Co., Fermont.
For primary bibliographic entry see Field 5G.
W78-07023

LOCATING UNDERGROUND PIPES AT SEWAGE WORKS.
For primary bibliographic entry see Field 8G.
W78-07031

ASBESTOS-CEMENT PIPES FOR OUTFALL SEWER.
Pipes and Pipelines International, Vol. 22, No. 5, p 33, October, 1977.

Descriptors: *Outfall sewers, *Pipelines, *Pipes, *Concrete pipes, *Asbestos cement, Sewerage, Construction materials, Equipment, Conveyance structures, Asbestos, Waste water treatment, Waste water disposal, Municipal wastes.

The installation of an outfall sewer constructed of asbestos-cement pipes, manufactured by TAC Construction Materials Ltd is described. The final outfall sewer designed for Peterborough Eastern, included four miles of Turnall and Everite asbestos-cement pipes. Pipe diameters ranged 500-900 mm; transportation of the pipes to the outfall sewer site was completed within a seven day period so that pipes could be joined before installation. The location of the rising main was calculated by a laser beam which was directed over the pipe crowns. The rising man was constructed of 500 mm diameter pipe which did not require a jointing tackle for connection. A trench safety shield was employed during installation of the 5 m long, 900 mm diameter pipes rather than shuttering because of excessive groundwater below the 4 m excavation depth. (Lisk-FIRL)
W78-07044

OVERFLOW ABATEMENT ALTERNATIVES SELECTED BY COMBINING CONTINUOUS AND SINGLE EVENT SIMULATIONS,
Dorsch Consult, Munich (Germany).
For primary bibliographic entry see Field 5G.
W78-07059

INFILTRATION-INFLOW SEWER LINE ANALYZER,
For primary bibliographic entry see Field 5A.
W78-07076

PROCESS AND SYSTEM FOR TREATING WASTE WATER,
Battelle Pacific Northwest Labs., Richland, WA. (Assignee).
D. E. Olesen, and A. J. Shuckrow.
United States Patent 4,076,615. Issued February 28, 1978. Official Gazette of the United States Patent Office, Vol. 967, No. 4, p 1568-1569, February, 1978. 1 fig.

Descriptors: *Activated carbon, *Biological treatment, *Activated sludge, *Patents, *Aeration, Coagulation, Flocculation, Oxygen, Organic wastes, Design data, Waste water treatment.

A patent has been issued for a combined powdered activated carbon-aerated biological treatment process to remove dissolved organic substances from waste water. Waste water is introduced into an oxygen aeration chamber containing 50 mg/liter powdered activated carbon and 100 mg/liter alum. The organic particles are adsorbed onto the carbon which is coagulated by the alum. Alum is precipitated as aluminum hydroxide by pH adjustment. Sludge and supernatant are produced with the addition of a polyelectrolyte flocculant; the sludge is aerated to enhance microbial degradation of the organic substances. Thermal regeneration of the sludge reactivates the carbon and converts the aluminum hydroxide to alumina. A portion of the activated sludge is returned to the initial aeration chamber for mixing with influent; the remainder is acidified with sulfuric acid to convert the alumina to alum. The sludge containing the reactivated carbon and alum is recycled to the aeration chamber for contact with the incoming waste water. (Lisk-FIRL)
W78-07079

PROCESS FOR THE BIOLOGICAL PURIFICATION OF SEWAGE,
L. Verde.
United States Patent 4,076,616. Issued February 28, 1978. Official Gazette of the United States Patent Office, Vol. 967, No. 4, p 1569, February, 1978. 1 fig.

Descriptors: *Activated carbon, *Biological treatment, *Oxygenation, *Aerobic treatment, *Patents, Design data, Filtration, Percolation, Bacteria, Waste water treatment, Municipal wastes.

A patent has been issued for a biological treatment process using activated carbon particles have a size range of 1.5-8.0 mm. Oxygen-bearing air is injected into an intermediate layer of the activated sludge bed, aerating only that portion of the activated carbon above that layer. The waste water percolates through the activated carbon bed at a rate less than 2 m/hr, providing a contact time in the layer above the intermediate level of 30 min or more. The lower levels of the activated carbon bed are free of bacterial colonies. Bacteria are retained within the intermediate layer as the waste water percolates through. (Lisk-FIRL)
W78-07081

SONIC CAVITATION AND OZONATION OF WASTE MATERIAL,
TII Corp., Lindenhurst, NY. (Assignee).
D. Bybel, N. Bellmore, R. F. Furey, and D. P. Stahl.
United States Patent 4,076,617. Issued February 28, 1978. Official Gazette of the United States Patent Office, Vol. 967, No. 4, p 1569, February, 1978. 1 fig.

Descriptors: *Ozone, *Patents, *Cavitation, *Bubbles, *Liquid wastes, *Waste water treatment, Acoustics, Physical control, Design data, Equipment.

A patent has been issued for a waste water treatment process which employs acoustic energy and ozone. The liquid waste is introduced into a vessel equipped with diffusers for emitting a gas stream containing 0.5-1.0% ozone. The bubbles cover at least 90% of the cross-sectional area of the vessel and act as a barrier to divide the vessel into a lower treatment section and an upper ozone contact region. Acoustic energy is applied to the waste water in the lower section at a level sufficient to cavitate and emulsify the waste material. The material is then transferred to the upper section where it is contacted with the ozone-bearing gas stream. (Schulz-FIRL)
W78-07082

METHOD FOR TREATMENT OF DIGESTOR SUPERNATANT AND OTHER STREAMS IN WASTEWATER TREATMENT FACILITIES,
M. D. Rickard.
United States Patent 4,076,515. Issued February 28, 1978. Official Gazette of the United States Patent Office, Vol. 967, No. 4, p 1541, February, 1978. 1 fig.

Descriptors: *Sludge treatment, *Dewatering, *Ammonia, *Sludge digestion, *Patents, Methane, Steam, Carbon dioxide, Nitrogen, Organic wastes, Design data, Lime, Waste water treatment, Municipal wastes.

A waste water treatment process to remove ammonia from the supernatant of anaerobically digested sludge has been patented. The waste water sludge is thickened and placed in an anaerobic digester where the organic materials are converted to methane and carbon dioxide; the nitrogen in the sludge is converted to ammonia. The digester supernatant is decanted from the tank; the digested sludge is dewatered by vacuum filtration. The dewatering liquor, containing water soluble ammonia, is mixed with the supernatant. The mixture is then reacted with a stoichiometric excess of lime. The ammonia salts contained in the supernatant and dewatering liquor are converted to aqueous or free ammonia which is contacted in a reactor with steam under low pressure. The ammonia is thus reduced to a less soluble form. The digested sludge is dried for use as fertilizer. (Lisk-FIRL)
W78-07088

DATA REPORT: MEADOW/MARSH/POND SYSTEM,
Brookhaven National Lab., Upton, NY. Dept. of Applied Science.
M. Small, and C. Wurm.
Available from the National Technical Information Service, Springfield, VA 22161 as BNL-50675, Price codes: A03 in paper copy, A01 in microfiche. Brookhaven National Laboratory, Associated Universities, Inc., April, 1977. 28 p. 16 fig, 2 tab, 14 ref.

Descriptors: *Biological treatment, *Nutrient removal, *Sewage treatment, Marshes, Ponds, Nitrogen, Phosphorus, Coliforms, Oxygen demand, Wetlands, Waste water treatment, New York, Meadows.

This report summarizes 13 months' operating data, August 1975-August 1976, from the Meadow/Marsh/Pond system, one of two natural sewage-treatment systems constructed at Brookhaven National Laboratory. These systems are free of disease vectors, aerosals, and objectionable odors. The Meadow/Marsh/Pond system appears superior to the Marsh/Pond system for renovating blends of septage and weak sewage to groundwater recharge quality. The only conclusion offered at the present time is that the system will produce potable water from raw sewage following recharge of pond effluent through a vegetated sandy soil. (Stihler-Mass)
W78-07145

BIOLOGICAL MICROORGANISM ACTIVITY CONTROL--IN SEWAGE TREATMENT BY COMPUTER FED WITH OXYGEN CONC., TEMP., PH AND TURBIDITY READINGS.
German Patent DS 2532-199. Issued February 23, 1978. Derwent German Patents Abstracts, Vol A, No 9, p 3, April, 1978.

Descriptors: *Biological treatment, *Microbial degradation, *Computers, *Instrumentation, *Patents, Measurement, Automation, Turbidity, Oxygen demand, Temperature, Aerated lagoons, Aeration, Patents, Waste water treatment.

A patent has been issued for a computerized method to control the biological treatment of waste water with respect to the quality of the effluent. The treatment process utilizes an aeration reactor, a clarification tank, and a secondary sludge aeration chamber. Oxygen concentration, turbidity, pH, temperature, and flow rate of the waste water into the aeration reactor are monitored by a computer. The biological activity of the microorganisms in the waste water is measured according to the temperature-dependent oxygen demand value obtained automatically from oxygen and turbidity data. The pH in both reactors is maintained at the desired value via additions of alkaline or acidic solutions. Variations in the specific oxygen demand, which directly relates to the microbial activity, are automatically controlled by adjustments in the inflow rate, aeration rate, and composition of added nutrients in the waste solution in one or both reactors. (Lisk-FIRL)
W78-07150

SEWAGE PURIFICATION PLANT FOR SMALL COMMUNITIES--OPERATING BY EXTENDED AERATION WITH GLASS WOOL MAT TO IMPROVE OXIDATION.
French Patent FR 2347-313. Issued December 9, 1978. Derwent French Patents Abstracts, Vol A, No 5, p 4-5, March, 1978.

Descriptors: *Oxidation, *Patents, *Aeration, *Activated sludge, *Flotation, Design data, Construction materials, Sludge treatment, Bubbles, Waste water treatment.

An extended aeration sewage treatment plant which uses a glass wool layer to diffuse air bubbles for small waste loads has been patented. The sewage treatment plant is a conical tank divided into a decantation zone containing a layer of glass wool coated with a polyester resin and an oxidation zone near the inside of the tank. Waste water is introduced into the base of the oxidation zone where air bubbles are supplied by a compressor. The waste passes into the decantation zone which is partitioned into four cells with walls bearing alternating top and bottom holes. Activated sludge and other heavy matter is separated and recirculated through the holes and is retained on the glass wool. Bulked sludge floats with the air bubbles to the surface of the tank through the upper cell of the decantation tank. The clarified liquid is free of suspended solids; the oxidation yield is high. (Lisk-FIRL)
W78-07151

PHOSPHORUS REMOVAL DEMONSTRATION STUDIES USING LIME, ALUM AND FERRIC CHLORIDE AT C. F. B. BORDEN,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
W. E. Stepko, and D. T. Vachon.
Technology Development Report EPS 4-WP-78-2, February, 1978. 41 p, 4 fig, 12 tab, 5 ref, 3 append.

Descriptors: *Phosphorus removal, *Separation techniques, *Waste water treatment, Lime, Biochemical oxygen demand, Solid wastes, Suspended solids, Effluents, Operating costs, Model studies, *Alum, *Ferric chloride, Canadian Forces Base, Borden.

Full scale phosphorus removal studies were conducted at the primary wastewater treatment plant at Canadian Forces Base (C. F. B.) Borden during 1974. Treatment plant performance with respect to total phosphorus, BOD5, and suspended solids removals was monitored under baseline (no chemical addition) and at various lime, alum and ferric chloride addition levels. The effluent total phosphorus objective of 1 mg per L was achieved with lime or alum addition to the primary influent at dosages of 250 mg per L Ca(OH)2 and 12 mg per L Al, respectively. For dosages of ferric chloride ranging from 9.6 to 26.6 mg per L Fe, this objective could not be achieved. Chemical addition improved BOD5, and suspended solids removal efficiencies. Based on the annual chemical operating costs, it was determined that it was cheaper to remove phosphorus by using alum than lime. (WATDOC)
W78-07167

SLUDGE DEWATERING DESIGN MANUAL,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
H. W. Campbell, R. J. Rush, and R. Tew.
Canada-Ontario Agreement on Great Lakes Water Quality, Research Report No. 72, 1978. 133 p, 42 fig, 66 ref, 13 tab, append. 75-3-22.

Descriptors: *Dewatering, *Sludge, *Solid wastes, *Sludge digestion, *Sludge treatment, Zeta potential, Hydrogen ion concentration, Alkalinity, Rheology, Resistance, Compressibility, Capillary action, Flotation, Filtration, Design, Estimated costs, *Sludge characterization, *Sludge conditioning, *Sludge quantities, Design methodology, Cost estimation methodology.

The dewatering manual integrates bench and pilot scale data generated at the Wastewater Technology Centre with information assembled from the literature, with a view to presenting a practical step-by-step procedure for estimating the size and cost of sludge dewatering installations. Sludge characterization tests are identified, along with a discussion of each test and its potential use for design purposes. A procedure for estimating the quantities of primary, waste activated and digested sludge, including the contribution of sludge from phosphorus removal processes, is presented. Process design procedures for gravity thickening, dissolved air flotation, centrifugation, vacuum filtration and pressure filtration are presented. The procedure for each dewatering method includes a description of the unit process, a discussion of applicable bench or pilot plant

tests, a suggested method of scale-up and an example problem. Cost data (December, 1975) for the major pieces of equipment required for each process have been obtained from equipment suppliers and are reported as a function of an appropriate design parameter. Operating and maintenance costs collected from the literature are summarized. A methodology for developing cost estimates is presented and illustrated with example calculations. (WATDOC)
W78-07168

LAND DISPOSAL OF SEWAGE SLUDGE VOLUME V (APRIL, 1976 - MARCH, 1977),
Guelph Univ. (Ontario). Dept. of Land Resources Sciences.
For primary bibliographic entry see Field 5E.
W78-07170

THE ANALYSIS OF CHEMICAL DIGESTER SLUDGES FOR METALS BY SEVERAL LABORATORY GROUPS,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
R. Knechtel, K. Conn, and J. Fraser.
Technology Development Report EPS 4-WP-78-1, January, 1978. 38 p., 16 ref., 22 tab.

Descriptors: *Sludge digestion, *Sludge treatment, *Sludge disposal, *Phosphorus, Sewage sludge, Fertilizers, Soil contamination, Metals, Analysis, Laboratory tests, Analytical techniques, Spectrophotometry, Absorption, Standards, Treatment facilities, *Atomic absorption spectrophotometry.

The research program, conducted under the Canada-Ontario Agreement on Great Lakes Water Quality, identified a significant concern for the disposal of municipal sludges produced from the chemical treatment of sewage for phosphorus removal. As a result, a comprehensive, multi-agency program was established to examine the potential use of sludge as fertilizer and to investigate the risk of sludge becoming an environmental contaminant. To help verify analytical data collected, an interlaboratory comparison was conducted on four homogenized and dried municipal sludges from sewage treatment plants where chemical treatment was used for phosphorus removal. Constituents of interest were various metallic species. This report presents results obtained on the samples by atomic absorption spectrophotometry following sample pretreatment. The preparation of standards, aspects of sample preparation and problems encountered in the analysis of the samples are discussed. The atomic absorption data is compared to results obtained on the same samples by X-ray fluorescence, activation analyses (neutron and photon) and atomic emission. Finally, the samples are suggested for use as 'standards' for analysis of similar materials. (WATDOC)
W78-07175

AN INVENTORY OF THE FRUIT AND VEGETABLE PROCESSING INDUSTRY IN CANADA,
Stanley Associates Engineering Ltd., Edmonton (Alberta).
For primary bibliographic entry see Field 5G.
W78-07177

WARM SLUDGE DIGESTION WITH OXYGEN--USING OFF-GAS FOR TREATMENT OF WASTEWATER.
German Patent DS 2528-800. Issued February 2, 1978. Derwent German Patents Abstracts, Vol. A, No. 6, p 4, March, 1978.

Descriptors: *Activated sludge, *Aeration, *Patents, *Biological treatment, *Oxygen, Design data, Temperature control, Biochemical oxygen demand, Suspended solids, Waste water treatment, Municipal wastes.

A patent has been issued for a temperature-controlled sludge digestion process with off-gas aeration. A mixture of effluent and activated sludge is aerated with gas containing at least 40% O2 to yield a dissolved oxygen concentration of 0.5 mg/liter in the mixture. The temperature of the covered aeration tank is maintained above 15C during mixing; activated sludge, clarified liquid, and unused O2 are then decanted from the tank. The excess activated sludge is aerated in an enclosed degradation chamber with a gas containing at least 80% O2 at a temperatue of 25-75C. The total solids in the slurry is maintained above 1,500 mg/liter and the temperture 10C higher than the temperature in the aeration chamber. Dissolved oxygen is maintained at 2 mg/liter to degrade at least 60% of the volatile suspended solids. Stabilized sludge residue and depleted O2 gas are drawn off after the desired decomposition level is achieved. The depleted gas with an O2 content of at least 40% is recycled to the initial aeration stage. This feed gas is withdrawn at a rate that reduces the O2 concentration to at least 35%. Similarly, the gas from the aeration tank contains less than 40% O2 by volume, controlled by the withdrawal rate. The process, which effectively reduces BOD, conserves energy via oxygen reuse. (Lisk-FIRL)
W78-07182

5E. Ultimate Disposal Of Wastes

GEOHYDROLOGICAL ENVIRONMENTAL EFFECTS OF GEOTHERMAL POWER PRODUCTION - PHASE IIA,
Systems, Science and Software, La Jolla, CA.
For primary bibliographic entry see Field 5B.
W78-06701

THE REDOX POTENTIAL OF ACTIVATED SLUDGE,
Northumbrian Water Authority, Gostorth (England).
For primary bibliographic entry see Field 5D.
W78-06706

WATER RECLAMATION AND RECYCLING,
South West Water Authority (England).
For primary bibliographic entry see Field 5D.
W78-06707

ASPECTS OF LAND-TREATED WASTE APPLICATIONS IN LOUISIANA WETLANDS,
Louisiana State Univ., Baton Rouge. Dept. of Marine Sciences.
For primary bibliographic entry see Field 5D.
W78-06744

SWINE WASTE NUTRIENT RECOVERY SYSTEM BASED ON THE USE OF THERMAL DISCHARGES,
Oregon State Univ., Corvallis. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W78-06745

LEACHATE DAMAGE ASSESSMENT: CASE STUDY OF THE SAYVILLE SOLID WASTE DISPOSAL SITE IN ISLIP (LONG ISLAND), NEW YORK,
Environmental Protection Agency, Washington, DC. Office of Solid Waste Management Programs.
For primary bibliographic entry see Field 5B.
W78-06752

LEACHATE DAMAGE ASSESSMENT: CASE STUDY OF THE FOX VALLEY SOLID WASTE DISPOSAL SITE IN AURORA, ILLINOIS,
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5B.
W78-06754

DISPOSAL OF FLUE GAS CLEANING WASTES: EPA SHAWNEE FIELD EVALUATION - INITIAL REPORT,
Aerospace Corp., Los Angeles, CA. Environment and Energy Conservation Div.
R. B. Fling, W. M. Graven, F. D. Hess, P. P. Leo, and R. C. Rossi.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 876, Price codes: A10 in paper copy, A01 in microfiche. Report No. EPA-600/2-76-070, March, 1976. 221 p, 56 fig, 10 tab, 32 ref, 3 append. ROAP No ABA-001, 68-02-1010.

Descriptors: *Sludge disposal, *Electric power, *Ponding, *Waste water disposal, *Leachates, Water quality, Monitoring, Tennessee Valley Authority, Kentucky, Cost analysis, Capital costs, Operating costs, *Flue gas desulfurization wastes, *Shawnee Power Station, Paducah(KY), Disposal ponds.

A status report describes the progress made in the initial phase (September 1974 - July 1975) of a field evaluation program conducted by EPA at the Tennessee Valley Authority Shawnee Power Station at Paducah, Kentucky, which was conducted to assess techniques for the disposal of power plant flue gas desulfurization (FGD) wastes. Two 10-MW prototype flue gas scrubber systems produce sludge that has been stored in the 5 disposal ponds on the plant site. Two of the ponds contain untreated wastes. Of the 3 treated sludge ponds, one represents an impoundment behind a dam, and two represent low spots (undrained) within a landfill. Ponds are monitored for leachate, supernate and groundwater quality, and soil and fixed sludge core characteristics. Results thus far indicate: (1) the leachates from ponds containing treated sludge show significantly lower concentrations of major soluble species and trace metals than do leachates from ponds containing untreated sludge; (2) the concentrations of major constituents in the leachate from ponds containing untreated sludge are increasing to levels approaching those of the input liquor; (3) the ground waters being monitored for all ponds show no effect from either treated or untreated sludge disposal; and (4) the estimated total disposal cost for treated sludge of the Shawnee Type, including capital and operating costs, is in the range of $7.30 to $11.40/ton of dry sludge in 1975 dollars; this estimate is based on a 50% average annual power load factor over a 30-year service life. (Seip-IPA)
W78-06756

COSTS OF WASTEWATER TREATMENT BY LAND APPLICATION, MCD-10,
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.
For primary bibliographic entry see Field 5D.
W78-06760

ALTERNATIVE WASTE MANAGEMENT TECHNIQUES FOR BEST PRACTICABLE WASTE TREATMENT, MCD-13.
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.
For primary bibliographic entry see Field 5G.
W78-06765

VIRAL MONITORING OF WASTEWATER AEROSOLS,
Michigan Univ., Ann Arbor, Dept. of Epidemiology.
For primary bibliographic entry see Field 5A.
W78-06806

RESEARCH NEEDS RELATING TO ON-SITE TREATMENT OF DOMESTIC WASTES.
Maine Univ. at Orono. Land and Water Resources Inst.
For primary bibliographic entry see Field 5D.
W78-06807

EFFECTS OF WATER TREATMENT PLANT WASTES ON DOMESTIC WASTEWATER TREATMENT PROCESSES,
Auburn Univ., AL. Water Resources Research Inst.
For primary bibliographic entry see Field 5D.
W78-06811

NET DRIFT IN AN ATYPICAL ESTUARY, LONG ISLAND SOUND,
Naval Ocean Research and Development Activity, Bay St. Louis, MS.
For primary bibliographic entry see Field 5B.
W78-06843

CONTAMINANT INPUTS TO THE NEW YORK BIGHT,
National Oceanic and Atmospheric Administration, Boulder, CO. Marine Ecosystems Analysis Program.
For primary bibliographic entry see Field 5B.
W78-06858

OIL SPILL: DECISIONS FOR DEBRIS DISPOSAL. VOL I: PROCEDURES MANUAL,
SCS Engineers, Long Beach, CA.
For primary bibliographic entry see Field 5G.
W78-06859

OIL SPILL: DECISIONS FOR DEBRIS DISPOSAL. VOL II, LITERATURE REVIEW AND CASE STUDY REPORTS,
SCS Engineers, Long Beach, CA.
For primary bibliographic entry see Field 5G.
W78-06860

MODEL ANALYSIS OF THE IMPACT ON GROUND-WATER CONDITIONS OF THE MUSKEGON COUNTY WASTEWATER DISPOSAL SYSTEM, MICHIGAN,
Geological Survey, Lansing, MI. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-06943

AN INTRODUCTION TO THE TECHNOLOGY OF SUBSURFACE WASTEWATER INJECTION,
Missouri Univ.-Rolla; and National Water Well Association, Worthington, OH.
D. L. Warner, and J. H. Lehr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 207, Price codes: A16 in paper copy, A01 in microfiche. Report EPA-600/2-77-240, December 1977. 355 p, 98 fig, 35 tab, 340 ref, 2 append.

Descriptors: *Injection wells, *Waste water disposal, Geologic formations, Sites, Drilling, Waste water treatment, Waste disposal, Industrial wastes, Rock properties, Design, Pumping, Well casings, Monitoring, Regulation.

When wastewater is injected into deep wells for disposal, it is necessary to undertake detailed evaluation of: (1) the geologic and hydrologic environment of the injection site and surrounding region; (2) physical, chemical, and biological characteristics of the wastewater; and (3) pre-injection wastewater treatment requirements. Injection well design and construction, pre-injection preparation and start up operations, and subsequent injection well monitoring may then proceed in light of these factors, given that injection is found to be feasible at all. This text has been designed for use by all those involved in the planning, design, construction, operation, and abandonment of injection wells. For those concerned with regulatory aspects, it provides minimum criteria necessary to protect ground water from degradation. Industries may use this manual to evaluate injection as an alternative to other means of waste disposal. (Eberle-NWWA)
W78-06965

APPLICATION OF BOREHOLE GEOPHYSICS TO SELECTION OF POTENTIAL SITES FOR DEEP-WELL DISPOSAL OF LIQUID WASTES,
D. L. Brown.
In: Groundwater Quality--Measurement, Prediction and Protection. Proc. of the Water Research Centre Conference, September 6-8, 1976, Univ. of Reading, Berks., England, p 221-245, (1976). 6 fig, 9 ref.

Descriptors: *Borehole geophysics, *Logging(Recording), *Injection wells, Electrical studies, Resistivity, Dissolved solids, Salinity, Stratigraphy, Sites, Geologic formations, Waste water disposal.

Borehole geophysical methods are predominantly used in the field of waste disposal as a detection device to record the movement and passage routes of contaminants, however, these same methods can be used to great advantage in the initial evaluation of site potential for deep well injection. In areas for which salinity data are sparse, regional water quality maps can be constructed via resistivity or SP logs. Such maps can indicate fresh-saltwater interfaces, direction of intrusion, direction of recharge, and perhaps even structural trends if saltwater is shown leaking upward along fault planes. Formation characteristics can be evaluated by standard oil well borehole techniques. Concerning fracture detection, the acoustic borehole televiewer is one of the best tools for measurement of width, strike and dip. Combined interpretation of water quality and structural maps makes possible the determination of large areas as either poor disposal site risks, or good potential for further investigation by means of test drilling. (Eberle-NWWA)
W78-06972

HYDROCARBONS IN SEDIMENTS AND BENTHIC ORGANISMS FROM A DREDGE SPOIL DISPOSAL SITE IN RHODE ISLAND SOUND,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5B.
W78-06982

FEASIBILITY OF USING IRON ORE OVERBURDEN MATERIAL AS A MEDIA FOR DISPOSAL OF SECONDARY SEWAGE EFFLUENT IN NORTHEASTERN MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Forest Resources.
K. N. Brooks, J. P. Borovsky, D. J. Holtschlag, and A. C. Mace, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 307, Price codes: A04 in paper copy, A01 in microfiche. Minnesota Water Resources Research Center, Minneapolis, WRRC Bulletin 93, July 1976. 45 p, 6 fig, 9 tab, 42 ref, 6 append. OWRT B-102-MINN(1).

Descriptors: *Wastewater renovation, Groundwater recharge, Sewage effluents, *Waste disposal, *Minnesota, Land disposal, Soil treatment, Percolation, Sprinkler irrigation, Loam, Soil analysis, Feasibility.

Open pit mining for iron-ore and magnetic taconite in northeastern Minnesota has produced a landscape with numerous overburden deposits or manmade plateaus susceptible to erosion and a physical environment hostile to natural revegetation. Many of these plateaus are in close proximity to small municipalities. This study investigated the sprinkler application of secondary treated sewage effluent to the overburden material at two sites; one was deposited 20 years ago and the other 2 months prior to the beginning of the study. Irrigation of 6 cm in 8 applications over a 9-week period on a poorly drained site resulted in 98, 89, and 99 percent renovations of nitrate plus nitrite-nitrogen, total kjeldahl nitrogen, and total phosphorus, respectively, based on soil percolate concentrations at the 1.2 meter depth. Surface ponding of effluent was observed during these applications. Although renovation of sodium, potassium and chloride was also indicated, calcium and magnesium concentrations at 1.2 meters were increased. Irrigation of 60 and 120 cm over a 12-week period on the newly deposited site resulted in renovations of over 99 percent for phosphorus, and 80 to 90 percent for total kjeldahl nitrogen, based on soil percolate concentrations at the 1.0 meter depth. Nitrate plus nitrite-nitrogen, calcium, magnesium, and potassium concentrations were substantially higher at the 1 meter depth than respective concentrations in effluent. Soil chemical properties for both sites indicated that the overburden material was deficient in nitrogen and phosphorus prior to irrigation. The ameliorative effects of effluent irrigation on overburden stripping dumps would be limited in scope; however, if the establishment and growth of vegetation is promoted on such sites a more effective physical and biological filter system for subsequent sewage effluent disposal may be realized.
W78-07000

BIOLOGICAL CONTROL OF WATER POLLUTION.
Pennsylvania Univ., Philadelphia. Center for Ecological Studies in Planning and Design.
For primary bibliographic entry see Field 5D.
W78-07003

AQUACULTURE AS AN ALTERNATIVE WASTEWATER TREATMENT SYSTEM,
Oklahoma State Dept. of Health, Oklahoma City.
For primary bibliographic entry see Field 5D.
W78-07011

MAN-MADE DEBRIS ON THE BERING SEA FLOOR,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5B.
W78-07033

STUDY OF THE INTERMITTENT STREAMFLOW IN AN OPEN CHANNEL,
Gdansk Technical Univ. (Poland).
J. Geringer.
In: Mathematical Models in Hydrology, Volume 2. Proceedings of the Warsaw Symposium, Poland, July 1971. International Association of Hydrological Sciences Publication No 101, p 808-814, 1974. 7 fig.

Descriptors: *Gravity waves, *Open channels, *Hydraulics, Flow, Depth, Effects, Evaluation, Methodology, Equations, Systems analysis, Hydrology, *Streamflow.

The influence of some hydraulic parameters on the transformation of a gravity wave was tested, using a mathematical model and hypothetical prismatic open channel. The results alow the effects of Manning's equation and initial depth on the wave velocity and the depth of flow at any point of the channel to be evaluated. (See also W77-06708) (Bell-Cornell)
W78-07053

MOBILE SLUDGE TRAILER AND METHOD OF FILLING AND EMPTYING SAME,
Liquid Removal Service, Co., Inc., Broomall, PA. (Assignee).
A. Petroski.
United States Patent 4,082,672. Issued April 4, 1978. Official Gazette of the United States Patent Office, Vol. 969, No. 1, p 272, April, 1978. 1 fig.

Descriptors: *Sludge disposal, *Transportation, *Transfer, *Patents, *Design data, Biodegradation, Mechanical equipment, Baffles, Disposal, Sludge treatment, Waste water disposal, Municipal wastes.

A patent has been issued for a mobile sludge trailer designed to transport partially biodegradable sludge. A double-frusto conical tank, divided into two bilateral symmertic sections by a vertical plane, is mounted on a trailer frame. The floor of the tank slopes down towards the bottom of the bisecting vertical plane and contains a sludge discharge apparatus. The inside of the tank contains circular baffles which are mounted parallel to one another and extend from the top peripheral edge of the tank parallel to the tank's floor. The baffles are positioned to form a sludge discharge chute. Discharge of the sludge from the trailer is assisted by pressurization of the head space in the tank to increase the pneumatic and hydraulic pressure at the sludge discharge apparatus. Fluid is injected under pressure into the tank near the discharge point. The fluid mixes with the sludge to facilitate sludge discharge. The trailer also has means for loading sludge into the trailer. (Lisk-FIRL)
W78-07078

STATUS OF GROUNDWATER CONTAMINATION IN THE US,
Geraghty and Miller, Inc., Tampa, FL.
For primary bibliographic entry see Field 5B.
W78-07103

THE EFFECTS OF SOLID WASTE LANDFILL LEACHATES ON RECEIVING WATERS,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-07104

WATER QUALITY AT A SLUDGE ENTRENCHMENT SITE,
Agricultural Research Service, Beltsville, MD. Soil Nitrogen Lab.
For primary bibliographic entry see Field 5B.
W78-07110

DESIGN GUIDE FOR METAL AND NON-METAL TAILINGS DISPOSAL,
Bureau of Mines, Spokane, WA. Spokane Mining Research Center.
R. L. Soderberg, and R. A. Busch.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 858, Price codes: A07 in paper copy, A01 in microfiche. Report No. BuMines IC 8755, 1977. 136 p, 67 fig, 7 tab, 53 ref, 5 append.

Descriptors: *Mine wastes, *Waste disposal, *Mining, *Design criteria, Management, Testing, Construction, Sampling, Inspection, Instrumentation, *Tailings disposal, *Tailings embankments.

A design guide has been developed to assist the mining industry in the management of mill tailings disposal. Topics addressed include: basic considerations, site selection, subsurface exploration including laboratory and field testing, design criteria, initial construction, construction during operation, cores, blankets, and membranes, instrumentation, lope stability, maintenance, and inspection. The effects of environment, topography, and hydrogeology are also described. Various methods of stability analysis and factors affecting stability are reviewed. The guide is a useful checklist for designers, operators, and inspectors of tailings embankments, although specific solution to problems associated with embankments are not included. Appendices discuss tailings pond evaporation, runoff estimation, seepage and flow nets, slope stability analysis (simplified Bishop method) and nomenclature. (Seip-IPA)
W78-07123

HABITAT DEVELOPMENT ASPECTS OF THE DREDGED MATERIAL RESEARCH PROGRAM,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 6G.
W78-07158

SUBSURFACE WASTE DISPOSAL IN LAMBTON COUNTY, ONTARIO - PIEZOMETRIC HEAD IN THE DISPOSAL FORMATION AND GROUNDWATER CHEMISTRY OF THE SHALLOW AQUIFER,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
A. Vandenberg, D. W. Lawson, J. E. Charron, and B. Novakovic.
Technical Bulletin No. 90, 1977. 64 p, 37 fig, 4 tab, append.

Descriptors: *Waste disposal, *Industrial wastes, *Piezometry, *Water wells, *Oil wells, *Gases, *Groundwater, Disposal, Sampling, Aquifers, Movement, Subsurface drainage, Subsurface investigations, Subsurface runoff, Geologic mapping, Water chemistry, Model studies, *Canada, Lambton County(Ontario).

This report describes the results of a reconnaissance study on the effects of the disposal of liquid industrial wastes through wells into the subsurface of southwestern Ontario. The study was based primarily on the analysis of existing data concerning oil and gas wells, disposal wells, and water wells in Lambton County. A second important component of the study was a field survey and ground-water sampling program to help determine the chemistry and motion of shallow groundwaters in the County. It was hoped that the investigation of shallow groundwaters would provide some direct or indirect evidence for the effects of disposal at greater depths. Drilling records from oil and gas wells in Lambton County were computer processed to map the geological structure and the piezometric head in the disposal zone near the contact of the Dundee Formation and the Detroit River Group. The geological maps were in good agreement with the known geology of the area. Since there was considerable uncertainty about the exact location of the disposal zones within the 270 feet of the Lucas Formation and the validity of the piezometric data, a series of piezometric maps was prepared based on different subsets of the data base for the disposal interval. This uncertainty was made more evident by inconsistencies in the piezometric maps for the different data subsets. Several features of the resulting piezometric surface persisted, however, through all or most of the maps, and are therefore believed to be elements of the true piezometric surface. These persistent features are displayed in a final composite map, which exhibits a regional west-dip; hence, the regional motion of groundwater in the disposal interval is in that direction. (WATDOC)
W78-07166

SLUDGE DEWATERING DESIGN MANUAL,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
For primary bibliographic entry see Field 5D.
W78-07168

LAND DISPOSAL OF SEWAGE SLUDGE VOLUME V (APRIL, 1976 - MARCH, 1977),
Guelph Univ. (Ontario). Dept. of Land Resources Sciences.
T. E. Bates, E. G. Beauchamp, A. Haq, J. W. Ketcheson, and R. Protz.
Canada-Ontario Agreement on Great Lakes Water Quality, Research Report No. 73, 1978. Environmental Protection Service, Environment Canada, Ottawa, Canada, 203 p., 172 tab. 72-5-17.

Descriptors: *Sewage sludge, *Sludge disposal, Land use, *Disposal, *Agriculture, Soils, Surface runoff, Surface drainage, Nitrates, Nitrogen, Phosphorus, Pathogenic bacteria, Crop production, Crop response, Bromegrass, Corn(Field), Volatility, Waste disposal, *Ryegrass.

The objective of this research was to determine maximum rates of sewage sludge application which can be used on agricultural soil without contaminating subsurface water with nitrate nitrogen, and surface waters with elements pathogenic to humans and animals, and without reducing the yield or quality of the crops produced. This volume covers the period from April 1, 1976, to March 31, 1977 and discuss the results from the fourth year of field runoff studies with fall, winter and spring applied fluid sewage sludge on land cropped with grain corn. Nutrients and metals in runoff water were measured. The report also covers the fourth year of field rate and source studies with three sludges resulting from treatment of sewage with calcium hydroxide, ferric chloride and aluminum sulphate for phosphorus removal. One experiment involved surface sludge applications on a loam soil on which bromegrass was grown, and two experiments involved corn on a loam, and sandy soil. In a greenhouse experiment six fluid sewage sludges, selected for their high metal content, were applied to a soil previously adjusted to two pH levels. Eight crops of ryegrass were grown with sludges added before each crop. Half of the treatments received no sludge after the fifth crop. Crop growth and nutrient and metal uptake were studied. Field and laboratory studies have been used to estimate the nitrogen available from sludges and the rates of volatilization of nitrogen from surface applied sludge in the field. (WATDOC)
W78-07170

EVALUATION OF THE RADIOACTIVE WASTES DISPOSAL INTO THE DEEP OCEAN,
Kyoto Univ. (Japan). Dept. of Sanitary Engineering.
I. Aoyama, M. Yamamoto, and Y. Inoue.
Health Physics, Vol. 33, No. 3, p 227-240, 5 fig, 12 tab, 16 ref. Sept. 1977.

Descriptors: *Environmental effects, *Water pollution, Radionuclides, Model studies, Disposal, Waste disposal, Oceans, Nuclear powerplants, Japan, Radioactivity, Hazards.

Models were used to assess the hazards for deep sea disposal of low level radioactive solid wastes originating from nuclear power plants in Japan. Calculations take account of leaching characteristics of radionuclides from solidified wastes. Comparing the results of calculations for two different radionuclides, it was found that a large retention capacity of radionuclides in the concrete was effective to decrease the concentration of radionuclides in the surface water soon after disposal. The key factor which most affected the concentration was found to be the depth of the sea where the wastes would be disposed of by the technique of sensitivity analysis. The level of significance of parameters was changeable with time. (Chilton-ORNL)
W78-07187

HYGIENIC EVALUATION OF FARM CROPS IRRIGATED WITH EFFLUENTS OF COAL-TAR CHEMICAL PLANTS (IN RUSSIAN),
Kiev Inst. of Nutritional Hygiene (USSR).
For primary bibliographic entry see Field 5C.
W78-07194

5F. Water Treatment and Quality Alteration

FEDERAL GUIDELINES: STATE AND LOCAL PRETREATMENT PROGRAMS, MCD-43, (3 VOLS).
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.

For primary bibliographic entry see Field 5G.
W78-06704

A STUDY ON WATER POLLUTION CONTROL IN WATER SUPPLY SYSTEMS--BACKFLOW PREVENTER IN WATER SUPPLY SYSTEMS (KYUSUI SETSUBI NI OKERU JOSUI OSEN BOSHI NI KANSURU KENKYU),
For primary bibliographic entry see Field 5D.
W78-06711

PRELIMINARY DESIGN OF A HOUSEHOLD REFUSE GRINDER,
Foster-Miller Associates, Inc., Waltham, MA.
For primary bibliographic entry see Field 5D.
W78-06758

PUBLIC BEHAVIOR AND ATTITUDES IN RESPONSE TO REPORTED HAZARDOUS DRINKING WATER. A FEASIBILITY STUDY,
Minnesota Univ., Duluth. Dept. of Sociology and Anthropology.
For primary bibliographic entry see Field 5G.
W78-06779

EFFECTS OF WATER TREATMENT PLANT WASTES ON DOMESTIC WASTEWATER TREATMENT PROCESSES,
Auburn Univ., AL. Water Resources Research Inst.
For primary bibliographic entry see Field 5D.
W78-06811

A CASE OF POISONING BY AMMONIUM SULFATE IN DRINKING WATER (IN RUSSIAN),
Ministerstvo Zdravookhraneniya SSSR, Moscow.
For primary bibliographic entry see Field 5C.
W78-06866

DETERMINATION OF THE FLUORIDE ION IN THE PUBLIC HEALTH STUDY OF WATER (IN ITALIAN),
Siena Univ. (Italy). Inst. of Hygiene.
For primary bibliographic entry see Field 5A.
W78-06896

DRINKING WATER AND HUMAN HEALTH: PART II,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 5A.
W78-06971

WATER SUPPLY FEASIBILITY STUDIES IN PHILIPPINES,
Camp, Dresser and McKee, Inc., Boston, MA.
L. V. Gutierrez, Jr.
Journal of the Urban Planning and Development Division, Vol 104, No UP1, Proceedings of the American Society of Civil Engineers, p 59-71, May 1978. 3 fig, 5 tab.

Descriptors: *Cost benefit analysis, *Water supply, *Feasibility studies, *Public health, *Philippines, *Foreign engineering, Water quality, Financing, Planning, Waterworks, Economic analysis.

Field tests show that most water distribution systems have old and inadequately sized pipes with considerably reduced capacities, resulting in low pressures and marginal fire-fighting capabilities. Water sources, both surface and ground, are generally available, but water-handling facilities must be properly planned and constructed to convey the water to the demand centers. Water demand will increase exponentially as population grows and standard of living and opportunity increases. Quantifiable economic benefits exceed the known costs of the water supply construction stages, which are financially viable if water rates are set on the basis of the consumers' ability to pay. As a result of these feasibility studies, water supply projects are now being provided much needed foreign exchange by international loaning agencies. (Bell-Cornell)
W78-07047

5G. Water Quality Control

FEDERAL GUIDELINES: STATE AND LOCAL PRETREATMENT PROGRAMS, MCD-43, (3 VOLS).
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.
Available from GSA (8FFS), Centralized Mailing Lists, Denver, CO 80225. Report No. EPA-430/9-76-017a, No. EPA-430/9-76-017b, No. EPA-430/9-76-017c, January, 1977. Volume I, 196 p, 22 fig, 7 tab. Volume II, 239 p, 16 fig, 24 tab, 288 ref, 7 append. Volume III, 418 p, 86 fig, 84 tab, 1 append.

Descriptors: *Waste water treatment, *Facilities, Management, Industrial wastes, Industrial water, Pollutants, Pollutant identification, Pollution abatement, Monitoring, Pollutant discharge.

Guidelines prepared in accordance with section 304(f) of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) to assist municipalities, States, Federal agencies, and others in developing requirements for the pretreatment of wastewaters which are introduced into publicly-owned treatment works, are presented. Technical and adminsitrative information relative to pretreatment and the control of industrial wastewaters is included. The information provides a basis for determining the impact of non-residential wastewaters and appropriate approaches for controlling pollutants from these sources. Also provided is guidance in complying with special conditions of the National Pollutant Discharge Elimination system permits relating to non-residential wastewaters. Information is given on managment of pollution control programs, legal aspects, monitoring, pollutant types and environmental considerations, and removal and pass through of pollutants in publicly-owned treatment works. The appendices contain pretreatment standards, secondary treatment information, test procedures for analysis of pollutants, effluent guidelines and standards, pollutant interference data, pollutant removal and pass through data, annotated bibliography, and data on major industries contributing wastewater to publicly-owned sewer systems and treatment works. (Wares-IPA)
W78-06704

A STUDY ON WATER POLLUTION CONTROL IN WATER SUPPLY SYSTEMS--BACKFLOW PREVENTER IN WATER SUPPLY SYSTEMS (KYUSUI SETSUBI NI OKERU JOSUI OSEN BOSHI NI KANSURU KENKYU),
For primary bibliographic entry see Field 5D.
W78-06711

INFLUENCE OF TIDAL INLETS ON SALINITY IN ESTUARIES,
Indian Inst. of Tech., Madras. Hydraulic Engineering Lab.
For primary bibliographic entry see Field 5B.
W78-06733

COAL GASIFICATION AND WATER RESOURCES DEVELOPMENT,
Ohio State Univ., Columbus. Dept. of Civil Engineering.
For primary bibliographic entry see Field 3E.
W78-06740

AUTOMATIC CONTROL STRATEGIES FOR URBAN STORMWATER,
Northern Arizona Univ., Flagstaff. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W78-06749

LEACHATE DAMAGE ASSESSMENT: CASE STUDY OF THE FOX VALLEY SOLID WASTE DISPOSAL SITE IN AURORA, ILLINOIS,
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5B.
W78-06754

A GUIDE TO ENVIRONMENTAL BENEFITS ASSESSMENT IN ECONOMIC IMPACT STUDIES.
Governors State Univ., Park Forest South, IL. Environmental Management Program.
For primary bibliographic entry see Field 6B.
W78-06755

DISPOSAL OF FLUE GAS CLEANING WASTES: EPA SHAWNEE FIELD EVALUATION - INITIAL REPORT,
Aerospace Corp., Los Angeles, CA. Environment and Energy Conservation Div.
For primary bibliographic entry see Field 5E.
W78-06756

ECONOMIC IMPACT OF PROPOSED AMENDMENTS TO MERCURY EFFLUENT STANDARDS IN ILLINOIS (R 76-17) (R 76-21),
Southern Illinois Univ. at Carbondale.
E. E. Cook, and L. Rogers.
Illinois Institute for Environmental Quality IIEQ Document No. 77/33, December, 1977. 244 p, 6 fig, 23 tab, 198 ref, 4 append. 80.093.

Descriptors: *Mercury, *Water quality standards, *Illinois, *Environmental effects, *Public health, *Industrial production, *Cost analysis, Employment, Water pollution treatment, Waste water treatment, Industrial water, Illinois Institute for Environmental Quality, Environmental Protection Act.

Economic and environmental impacts of proposed changes (submitted by the Illinois Institute for Environmental Quality) in the maximim allowable concentrations of mercury in water, of modifications in time-of-compliance regulations, and of deletion of requirements for reporting by those that use or maintain an inventory of mercury are assessed. The current Illinois Pollution Control Board Rules and Regulations mandate a maximum mercury concentration of 0.5 micrograms/l; the proposed change is to 3.0 micrograms/l. A cost-benefit approach is used to assess the reflected changes in prices, production activities, employment aspects, non-productive expenditures, and energy consumption; environmental and human health aspects are considered. A relaxed mercury effluent standard is not expected to adversely affect health, agriculture, or the environment. Compliance with present standards would probably result in partial or total closing of the Alton Box Board Company and the Monsanto Company. Adoption of the proposed standard could result in total annual benefits accrued by industry of $136,288,300 to $153,806,300 in treatment cost savings, 540 to 1890 saved jobs, and $5,500,000 to $29,500,000 in payroll savings; the municipal waste water treatment sector and the educational sector could reap benefits of $134,191,000 and $1,459,500/yr, respectively. If present standards were maintained the loss of production and industry would probably result in some general market price increases. Overall, the altered mercury concentration standards would result in significant benefits to industry, educational institutions, municipal waste water treatment districts, and the people of Illinois. (Seip-IPA)
W78-06759

HANDBOOK FOR SEWER SYSTEM EVALUATION AND REHABILITATION, MCD-19,
Environmental Protection Agency, Washington, DC. Municipal Construction Div.
For primary bibliographic entry see Field 5D.
W78-06761

FIFTH ANNUAL REPORT: GREAT LAKES WATER QUALITY.
International Joint Commission-United States and Canada.
Available from Great Lakes Regional Office, Windsor, Ontario, Canada N9A,6T. (1977). 11 p. append.

Descriptors: *Great Lakes, *Water pollution, *Water quality, Water treatment, Monitoring, Toxicity, Radioactivity, Phosphorus, Ecosystems, Conservation, Mapping, Environmental effects, Remedies, *Surveillance, *Lake restoration, Enforcement, International Joint Commission on Great Lakes Water Quality.

In a report prepared in accordance with the Great Lakes Water Quality Agreement of 1972, comments and recommendations are presented on conditions relating to Great Lakes Water quality in 1976 and on progress under the Agreement in the areas of municipal treatment, surveillance, industrial pollution, toxic substances, radioactivity, nonpoint pollution, phosphorus, water quality objectives, an ecosystem approach to Great Lakes restoration, environmental mapping, review of the water quality agreement, and public participation. Progress has been slow and uneven with respect to these subhject areas. For example, although the phosphorus control program has been encouraging to the participants, and total phosphorus loadings have decreased, the program is generally behind schedule and has not yet resulted in significant overall improvement. The Commission is also concerned with growing evidence of the dangers of toxic chemicals in the lakes and with the failure to implement enforcement measures on industrial and municipal sources of pollution. Forty-seven special problem areas have been identified, compared with 63 identified in 1975. The lack of major improvement is probably due to the size of the lakes and their resulting slow response to remedial programs. However, the development of coordinated programs of research, surveillance, and remedial measures is a distinct accomplishment. The appendix contains recommendations to the Commision by the Research Advisory Board and the Great Lakes Water Quality Board on control of toxic substances. (Wares-IPA)
W78-06762

COOLING TOWERS: A BIBLIOGRAPHY (JUNE 1977 - DECEMBER 1977).
Department of Energy, Oak Ridge, TN. Environmental Sciences Information Center.
Available from the National Technical Information Service, Springfield, VA 22161 as TID-3360-S2, Price codes: A05 in paper copy, A01 in microfiche. Bibliography TID-3360-S2, Compiled by D. O. Galde, February, 1978. 33 p. Issued by DOE, Washington, D.C., Technical Information Center.

Descriptors: *Cooling towers, *Nuclear powerplants, *Fossil fuels, *Electric powerplants, Ponds, Canals, Construction, Design, Economics, Environmental effects, Performance, Operations, *Bibliographies, *Fossil-fuels, *Electric powerplants, Ponds, Canals, Construction, Design, Economics, Environmental effects, Performance, Operations, *Bibliographies, *Fossil-fuel powerplants, *Cooling ponds, Natural draft cooling towers, Mechanical draft cooling towers.

A total of 214 abstracted references, containing information on various aspects of large cooling tower technology (including design, construction, operation, performance, economics, and environmental effects) for fossil-fuel and nuclear power plants, are presented. The towers considered included natural draft and mechanical draft types employing wet, dry, or combination wet-dry, or combination wet-dry cooling. A few citations are included on other types of condenser cooling systems, e.g., cooling ponds and canals. The citations were compiled from the ERDA Energy Information Data Base (EDB) covering the approximate period June 1977 (EDB File No. 77J 66159) to December 1977 (EDB File No. 77C 147831). Report citations are arranged alphabetically by report number; nonreport literature citations are arranged chronologically. Corporate, personal author, subject, and report number indices are provided. (Seip-IPA)
W78-06763

ENVIRONMENTAL ASPECTS OF WATER SPREADING FOR GROUND WATER RECHARGE,
Agricultural Research Service, Fresno, CA. Water Management Research.
For primary bibliographic entry see Field 4B.
W78-06764

ALTERNATIVE WASTE MANAGEMENT TECHNIQUES FOR BEST PRACTICABLE WASTE TREATMENT, MCD-13.
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.
Available from GSA (8-FY), Centralized Mailing List Services, Denver, CO 80225. Report No EPA-430/9-75-013, October, 1975. 71 p, 7 fig, 11 tab, 526 ref, 4 append.

Descriptors: *Waste disposal, *Management, Water quality, Navigable waters, Land use, Waste water treatment, Economics, Cost-benefit analysis, Cost-effectiveness.

Information pursuant to section 304(d)(2) of the Federal Water Pollution Control Act Amendments of 1972 is presented to guide operators of publicly-owned treatment works in selecting waste treatment alternatives to restore and maintain the integrity of the nation's waters. Criteria for treatment and discharge into navigable waters, land application and utilization practices, and reuse of treated wastewater are specified. The rationale behind the criteria is presented as well as information on acceptable alternative waste management techniques. Land application techniques discussed include irrigation, overland flow, and infiltration-percolation; land utilization techniques include land spreading of sludge, landfill of sludge and/or incinerator ash and composting and final disposal. Non-point sources of pollutants are also considered. Waste management techniques involving treatment and discharge, including flow reduction, secondary treatment and nitrification, storm and combined-sewer control, advanced waste treatment (nutrient removal), and sludge handling techniques are discussed. Reuse techniques are described for wastewater, and other treatment plant wastes, and for integrated reuse facilities. The appendices contain bibliographic material, cost-effectiveness analysis guidelines, secondary treatment information, and ground water requirements. (Wares-IPA)
W78-06765

A METHODOLOGY FOR PREPARING ENVIRONMENTAL ASSESSMENTS,
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 6G.
W78-06775

WATER QUALITY ASSESSMENT FOR THE KANAWHA RIVER BASIN (NORTH CAROLINA, VIRGINIA, WEST VIRGINIA),
Environmental Protection Agency, Wheeling, WV. Surveillance and Analysis Div.
R. C. George, and R. I. Cantor.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 132. Price codes: A03 in paper copy, A01 in microfiche. EPA Work Document No 50, September 1973. 31 p, 6 ref, 2 tab, 5 maps.

Descriptors: *Environmental effects, *Water quality, *Fishing, Planning, West Virginia, North Carolina, Recreation, Fish, Wildlife, Water pollution, River basins, Water quality standards, Water pollution, Virginia, *New River Basin, *Kanawha River, New River.

The report had four purposes: to assess current water quality; to investigate the causes responsible for the current situation; to study recent trends; and to project future water quality. Rather than being a detailed analysis of the basin's water qualities, the report was intended to serve as a baseline study for future planning that would be done to meet the Federal Water Pollution Control Act Amendments (1972) standards for water quality. Those water bodies that, in 1973 met the 1983 goals of water adequate for swimming and propagation of fish and wildlife are identified; and identification is made of those bodies that might achieve the 1983 goals by 1977, 1983 or later. The Kanawha Basin is described and then divided into two study units: (1) the Kanawha River and its tributaries; and (2) the New River and tributaries. Water quality is then investigated and trends reported. (Zayac-NC)
W78-06778

PUBLIC BEHAVIOR AND ATTITUDES IN RESPONSE TO REPORTED HAZARDOUS DRINKING WATER. A FEASIBILITY STUDY,
Minnesota Univ., Duluth. Dept. of Sociology and Anthropology.
R. E. Franz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 981. Price codes: A04 in paper copy, A01 in microfiche. Prepared for Health Effects Laboratory, Environmental Protection Agency, Cincinnati, OH. Report EPA-600/1-76-026, September 1976. 50 p, 2 append. P.O. 5-03-44975 Task 005.

Descriptors: *Water supply, *Social impacts, *Asbestos, *Psychological aspects, *Domestic water, *Feasibility studies, Water quality, Social values, Filtration, Surveys, Behavior, Chemical wastes, *Potable water, Public health, *Minnesota, *Survey design, *Hazardous wastes, Duluth(MN), Emergency water supply.

When it was learned that asbestiform fibers were present in the drinking water of Duluth, Minnesota, concern was manifested immediately and the Army Corps of Engineers provided filtered water for anyone wanting it. However, it was soon discovered that asbestiform contamination was not unique to Duluth and it was determined to test public attitudes on the use of filtered water where drinking water was reported hazardous. This report of the feasibility study presents a survey design to be used in this determination, and includes suggestions for sampling techniques and measurement considerations. The recommended questionnaire was pretested in Duluth, and a pilot study was undertaken there, with a total of 50 completed questionnaires resulting from the pilot study: the results indicate that such a feasibility study can be successfully pursued. (Zayac-NC)
W78-06779

WASHINGTON COUNTY PROJECT WORK PLAN: DEVELOPMENT AND IMPLEMENTATION OF SEDIMENT CONTROL ORDINANCE OR OTHER REGULATORY MECHANISM: INSTITUTIONAL ARRANGEMENTS NECESSARY FOR IMPLEMENTATION OF CONTROL METHODOLOGY ON URBAN AND RURAL LANDS,
Wisconsin Board of Soil and Water Conservation Districts, Madison.
For primary bibliographic entry see Field 4D.

W78-06780

TRIANGLE J 208 AREAWIDE WATER QUALITY MANAGEMENT PLAN.
Triangle J Council of Governments, Research Triangle Park, NC.
September 1977, 279 p, 32 tab, 4 maps, 2 fig.

Descriptors: *Water quality, *Management(Applied), *Planning, *Water management(Applied), *Water pollution sources, Land use, Institutions, Administration, Regulation, Administrative costs, Governments, *North Carolina, Waste treatment, *Federal Water Pollution Control Act Amendments, Triangle J Region(NC), 208 planning, Raleigh(NC), Durham(NC), Chapel Hill(NC), Point sources, Nonpoint sources, Waste management.

This plan identifies the ways in which the goals of the 1972 Federal Water Pollution Control Act Amendments (P.L. 92-500) will be achieved in the vicinity of Raleigh, Durham, and Chapel Hill, North Carolina. The Plan first quantifies the goals. The general goals are translated into a more specific set of numerical water characteristic goals. The quantified goals are compared with existing water quality in order to develop a management plan directed at the area's most important water quality needs. The general strategy is to improve and maintain the area's water quality by: improving existing programs and activities; meshing more effectively the existing programs and activities of state and local governmental agencies; assigning new programs and activities to appropriate governmental units or agencies; and changing organizational structures and management responsibilities where necessary to achieve water quality goals. The regulatory mechanisms capable or achieving the specific goals are identified. These mechanisms vary according to the source (point or nonpoint), the management responsibility of the relevant agency, and the cost. This plan is designed to coordinate efforts to restore and maintain the integrity of the waters in Region J. (Nessa-NC)
W78-06788

ELEVENTH ANNUAL REPORT PROGRAM ACTIVITIES, JULY 1, 1974-JUNE 30, 1975 (MARYLAND WATER RESOURCES RESEARCH CENTER).
Maryland Univ., College Park. Water Resources Research Center.
For primary bibliographic entry see Field 9D.
W78-06804

RESEARCH NEEDS RELATING TO ON-SITE TREATMENT OF DOMESTIC WASTES.
Maine Univ. at Orono. Land and Water Resources Inst.
For primary bibliographic entry see Field 5D.
W78-06807

WASTEWATER RECYCLING: DEVELOPMENT OF MYCORRHIZAL ROOT SYSTEMS FOR INCREASED EFFICIENCY,
Michigan State Univ., East Lansing. Dept. of Botany.
G. R. Safir, and B. M. Carpenter.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 972. Price codes: A03 in paper copy, A01 in microfiche. Completion Report. Institute of Water Research, Michigan State University, May, 1978. 45 p, 9 fig, 10 tab, 36 ref. OWRT A-089-MICH(1). 14-31-0001-6023.

Descriptors: *Vesicular mycorrhizae, Endomycorrhizae, *Micorrhizal water, *Gromus sp, Waste water treatment, *Recycling, *Root systems, Michigan, Olid field soils, *Spores, Irrigation, *Water Quality Management Project(Michigan), Quack grass.

An analysis of the spore populations of the dominant species of vesicular-arbuscular mycorrhizal fungi present in an old field terrestrial ecosystem treated with various levels of liquid wastewater during 1976 and 1977 was conducted. The spore types responded differently to the 4, 2, and 0 inch/week irrigation levels. From July 1976 to October 1977 a spore type, tentatively identified as Glomus mosseae, was dominant in the ecosystem and occurred in the 2 inch/week plots most. The total spore numbers were highest in the 4 inch plots in 1976, however, in 1977 the 2 inch plots contained by far the most spores with G. mosseae contributing the greatest numbers. Old field soil was shown to allow high levels of mycorrhizal infection (field) and significant mycorrhizal plant growth stimulation in the greenhouse for a wide range of plant species. Studies using nutrient solutions with nutrient contents similar to that of the wastewater and applied at field rates indicated that 2 inch/week irrigation rates greatly increased mycorrhizal growth stimulation. Results indicate that during 1976 and 1977 the mycorrhizal systems were probably functioning well, however, since total spore numbers dropped in 1977, further monitoring of the system is necessary before long term predictions can be made.
W78-06808

URBAN CHANNEL EROSION: PRELIMINARY ANALYSIS,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 4D.
W78-06810

GUIDELINES FOR THE DESIGN, CONSTRUCTION AND OPERATION OF TAILING PONDS AND DAMS,
Chafet (Arthur B.) and Associates, Denver, CO.
For primary bibliographic entry see Field 8A.
W78-06813

PACIFIC SOUTHWEST INTER-AGENCY COMMITTEE MINUTES OF THE 77-3 MEETING, 13-14 DECEMBER 1977, LAS VEGAS, NEVADA.
Pacific Southwest Inter-Agency Committee, San Francisco, CA.
For primary bibliographic entry see Field 6E.
W78-06815

WATER QUALITY STANDARDS AND COMMUNITY VIABILITY,
Iowa State Univ., Ames. Dept. of Economics.
R. A. D. Beck.
Paper presented at the 'Iowa Academy of Sciences, ' April 28-29, 1972. 16 p, 2 fig, 5 ref. OWRT A-999-IA (13).

Descriptors: *Mathematical model, *Mathematical studies, *Computer models, *Iowa, *Water management(Applied), *Water quality, Water supply, Planning, Management, Human population, Simulation analysis, *Des Moines River(Iowa), Demographics.

A quantitative model that was developed as a basis for computer simulation of a multi-county region, provides information and projections for use in planning for agricultural, industrial, and public services development and water management practices along a major portion of the Des Moines River. Procedures were designed to determine the structural characteristics of an 8-county region centered around Ottumwa, Iowa. The model contains a demographic sector; an employment sector; and output sector with structural characteristics of the multi-region economy (presented within the content of input-output analysis); local, state, and federal government sectors; a water quality sector; and a final demands sector. Analysis is made of major demographic-economic interactions, the relation of such interactions to present and future water quality and quantity restraints, and the impact of same on specific sectoral reallocation of employment, output, and the supply of public services. (Economic and population growth are interdependent in the dynamic model.) System interdependence facilitates an analysis of the impacts of a given (or desired) change in the hydrologic system on other interlocking aspects of the system: production, employment, migration, incomes, taxes, and government expenditures. The implications for economic efficiency when industrial, municipal, and agricultural pollution control perspectives are combined are determined by the model. (See also W73-06478) (Seip-IPA)
W78-06818

ENVIRONMENTAL RISK OF BEAUFORT SEA OIL SPILLS--A MANAGEMENT TOOL,
Coast Guard Research and Development Center, Groton, CT.
I. M. Lissauer, J. P. Welsh, and G. L. Hufford.
Marine Technology Society Journal, Vol 11, No 1, p 22-25, 1977. 5 fig, 7 ref.

Descriptors: *Oil spills, *Oil pollution, *Water pollution effects, *Baseline studies, Environmental effects, Resources development, Alaska, Outer Continental Shelf, *Beaufort Sea.

Minimum impact time and probability of impact of an oil spill are determined for 15 different potential sites located off the north Alaskan coast. Minimum impact times vary from 6 to 53 hours for the 15 sites that range from 2 to 15 nautical miles offshore. Probability of impact varies from 40 to 96%. A generalized equation is given for calculating minimum impact time for a spill to reach the shoreline from any site offshore of the north Alaskan coast. Large-scale development of the oil resources on the North Slope of Alaska is underway. Offshore drilling on the Beaufort Sea continental shelf is certain to be undertaken within the next few years. Because even the best of planning and the most modern of safety techniques cannot ensure that accidental oil spills will not occur, there is a definite need for an oil spill impact assessment for the north Alaskan coastline. It is the purpose of this paper to examine available environmental data and attempt to incorporate the information into a technique for delineating areas of the coastline which are most susceptible to environmental damage should a spill occur. The technique is appropriate for summer (July-September) coastal conditions when the area is essentially ice free. Future work will consider the effect of isolated ice fragments and the presence of an ice pack edge within the area. (Sinha-OEIS)
W78-06844

IMPROVING LAKE WATER QUALITY BY DESTRATIFICATION,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
R. G. Strecker, J. M. Steichen, J. E. Garton, and C. E. Rice.
Transactions of the American Society of Agricultural Engineers, Vol. 20, No. 4, p 713-720, July-August 1977. 17 fig, 12 ref. OWRT A-052-OKLA(3)and A-065-OKLA(1).

Descriptors: *Destratification, *Lakes, *Water quality control, Mixing, Quality control, Water circulation, Stratification, Equipment, Oxygen, Dissolved oxygen, Temperature, Water temperature, Biochemical oxygen demand, Hydrogen ion concentration, Water quality, Suspended solids, Turbidity, Pumps, Pumping, *Oklahoma, *Hams Lake(Okla).

A low-energy (746 W), high-volume (1.6 cu m/s) axial flow, propeller (1.8 m diameter) pump was designed and operated on a small (40 ha surface area, 9.5 m maximum depth, and 115 ha-m volume) stratified lake. The objectives were: (1) to design and construct a prototype, low-energy, axial-flow propeller pump for use as a destratification device;

(2) to evaluate the performance of the pump when moving water under a small head; and (3) to determine the effect of the pump's operation on the water quality parameters of a stratified lake. Four days of pumping were required to warm the bottom water to the surface water temperature with a resultant destratification efficiency of 3.3% for the period. Dissolved oxygen was maintained above 2.0 mg/l in the lower waters of the reservoir and above 5.0 mg/l in the surface waters. The overall water quality in the reservoir was improved. The fan laws provided an effective means of predicting the performance in water from the available data in air. The angle of divergence for the discharge cone was between 21 and 28 deg, and considerable amounts of water were entrained at the periphery of the discharge cone. (Sims-ISWS)
W78-06852

CONTINGENCY PLANNING FOR THE IMPACT OF OIL SPILLS IN DIFFERENT COASTAL ENVIRONMENTS OF CANADA,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
E. H. Owens.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A043 713, Price codes: A02 in paper copy, A01 in microfiche. Technical Report No. 243, Dec 1977. Reprinted from: Proceedings of 1977 Oil Spill Conference held New Orleans, LA, Mar 8-10, 1977. 12 p, 14 fig, 2 tab, 10 ref. ONR-N00014-75-C-0192.

Descriptors: *Oil spills, *Coasts, *Water pollution treatment, Planning, Resources development, Environmental effects, Beaches, *Outer Continental Shelf.

Planning for a cleanup operation of the shore zone requires consideration of the physical nature of the coast (including the sediment types), wave energy levels, and tidal range. Beaches exist in a dynamic state and are continuously changing in response to littoral processes. In addition to these temporal variations, there is frequently considerable variability of shoreline types and process characteristics within a small region. In eastern Canada, contingency planning must cover rocky shorelines, sand beaches, and muddy coasts. There also is a wide range of littoral process environments, from the exposed Atlantic coast to the sheltered Bay of Fundy, which has tidal ranges on the order of 10 to 15 meters. Three examples from eastern Canada illustrate the variability of shorelines and processes in he context of cleanup planning. (Sinha-OEIS)
W78-06856

OIL SPILL: DECISIONS FOR DEBRIS DISPOSAL. VOL I: PROCEDURES MANUAL,
SCS Engineers, Long Beach, CA.
R. P. Stearns, D. E. Ross, and R. Morrison.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 832, Price codes: A06 in paper copy, A01 in microfiche. EPA, Office of Research and Development, Environmental Protection Technology Series No. EPA-600/2-77-153a, August 1977. 115 p, 15 fig, 14 tab, 67 ref, 2 append. Contract 68-03-2200.

Descriptors: *Oil spills, *Oil pollution, *Waste disposal, *Oil wastes, *Water pollution, Landfills, Waste dumps, Outer Continental Shelf, Oil transport.

This report was prepared to guide persons responsible for disposing of oil spill debris in selecting suitable methods and sites, and in carrying out effective, environmentally safe disposal operations. Volume I is a procedures manual useful both in office and field. Topics covered include site selection and preparation, method selection, implementation of three alternative disposa methods, site monitoring requirements, and correctional measures for possible environmental problems. All available land disposal methods (other than systems employing incineration) were investigated prior to selecting the three recommended alternatives: land cultivation (also called landspreading), burial, and sanitary landfilling. An outline for a training course on oil spill debris disposal is also included. (See also W78-06806) (Sinha-OEIS)
W78-06859

OIL SPILL: DECISIONS FOR DEBRIS DISPOSAL. VOL II, LITERATURE REVIEW AND CASE STUDY REPORTS,
SCS Engineers, Long Beach, CA.
R. P. Stearns, D. E. Ross, and R. Morrison.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 953, Price codes: A08 in paper copy, A01 in microfiche. EPA Office of Research and Development, Environmental Protection Technology Series No. EPA-600/2-77-153b, Aug 1977. 166 p, 38 fig, 22 tab, 3 ref, 2 append. Contract No. 68-03-2200.

Descriptors: *Oil spills, *Oil wastes, *Bibliographies, *Waste disposal, Environmental effects, Pollution abatement, Water pollution sources, Waste dumps, Landfills, Outer Continental Shelf, Oil transport, Case studies.

This report was prepared to guide persons responsible for disposing of oil spill debris in selecting suitable methods and sites, and in carrying out effective, environmentally safe disposal operations. Volume II presents a bibliography and a summary of the current literature relating to oily waste decomposition, migration through soils, and interaction with the environment. Calculations are provided to indicate the theoretical limitations on degradation. Case studies of two sites where the land cultivation disposal method was used to aerobically decompose the oily debris, and at two other sites where the debris was buried in specially constructed cells, are described and the effectiveness of each operation is evaluated. (See also W78-06859) (Sinha-OEIS)
W78-06860

OIL SPILL AND OIL POLLUTION REPORTS, FEBRUARY-1977 -APRIL 1977,
California Univ., Santa Barbara. Marine Science Inst.
P. Melvin, H. Ehrenspeck, and P. Nordin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 689, Price codes: A15 in paper copy, A01 in microfiche. EPA, Office of Research and Development, Environmental Protection Technology Series No. EPA-600/2-77-111, June 1977. 336 p, append.

Descriptors: *Oil spills, *Oil pollution, *Water pollution sources, *Water pollution effects, *Bibliographies, Pollutant identification, Water quality control, Baseline studies, Resources development, Patents, Pollution abatement, Outer Continental Shelf, Petroleum development, Oil transport, Coastal zone.

Oil Spill and Oil Pollution Reports is a quarterly bulletin designed to review current scientific and technical publications and research projects in the field of oil pollution. Subject coverage includes all aspects of aquatic and terrestrial oil pollution. This issue contains summaries of research projects and published information selected from the scientific and technical literature during the period February, 1977 through April 1977. The following sections are included in the report: reports, publications, and patents; current research projects; and current oil-related conferences. (Sinha-OEIS)
W78-06861

A DISTRIBUTED KINEMATIC MODEL OF UPLAND WATERSHEDS,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 4D.
W78-06876

CONTROL OF TURBIDITY AT CONSTRUCTION SITES.
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
Study Team Report, December 1977. E. J. Carlson, Compiler, 189 p, 7 fig, 7 tab, 19 ref, 3 append.

Descriptors: *Turbidity, *Sediment pollution, *Turbidity measuring instruments, Western states, standards, Bureau of Reclamation projects, Flocculants, Coagulant aids, NPDES Permit Program, Construction activities, *Water pollution control, *Pollution abatement, *Turbidity Study Team(Bur Reclam).

A research study team investigated construction activities causing turbidity and turbidity control measures used by contractors on recent Bureau of Reclamation projects. Contractors' bids and engineers' estimates are included. Price information is included for two projects. A statistical analysis of turbidity measurements on the Arkansas River during construction of Pueblo Dam showing the number of samples required to yield a certain accuracy of turbidity measurements is included. Turbidity control laws in the western United States are given. Brief statements on policy of water pollution in the United States, Public Law 92-500, and other national documents are included. Available equipment for measuring turbidityf and available flocculants and coagulant aids are also listed. (Bur Reclam)
W78-06904

ENVIRONMENTAL QUALITY ASSESSMENT IN MULTIOBJECTIVE PLANNING,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 6G.
W78-06905

PROCEEDINGS OF THE INTERNATIONAL SYMPOSIUM ON MARINE POLLUTION RESEARCH.
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 601, Price codes: A09 in paper copy, A01 in microfiche. Report EPA-600/9-76-032, January 1976. 171 p. Compiled by S. P. Meyers. 1EA615, R 803141-01-0.

Descriptors: *Conferences, Pollutants, *Marine pollution research, *Water pollution, Path of pollutants, Coasts, Foreign research, Marine life, Marine animals, Marine plants.

Symposium papers discuss how man's activities have affected natural resources of a coastal environment. Participants, representing international aspects of coastal pollution, reviewed current status of research and procedures planned to minimize offshore coastal damage. Subjects included: 'An Overview of the USEPA Program in Marine Pollution Research', Carl R. Gerber; 'Responsibilities for Marine Pollution Research Within Federal Agencies of the United States,' Norman L. Richards; 'Overview of Marine Pollution Research in the Baltic,' K. Rozdzynski; 'Marine Pollution Research in Yugoslavia: An Overview,' V. Pravdic; 'Overview of Marine Pollution Research in Egypt,' Saad El-Wakeel; 'Overview on Pollution in the Coastal Environment of Pakistan and its Possible Implication for the Marine Ecosystem,' S. M. Haq; 'Overviews on Marine Pollution in India,' K Ranga Rao; 'Research Needs Concerning Pollution of the Marine Benthos,' R. C. Swartz; 'Hydrological, Chemical and Physical Processes Affecting Pollution of the Baltic Sea,' A. Trzosinska; 'Investigation of Pollution-Stressed Littoral Communities in the Northern Adriatic,' D. Zavodnik; 'Microbiology and Chemistry of Estuarine Surface Microlayers,' A. W. Bourquin and D. G. Ahearn; 'Survival of Viruses in the Marine Environment,'

George E. Schaiberger, Charles P. Gerba and Enrigue G. Estevez; 'Relationship of Marine Pollution to Human Health,' Ronald Engle; 'Bioassays as Indicators of Pollution Effects,' David L. Coppage. (See W78-06907 thru W78-06972)
W78-06906

AN OVERVIEW OF THE USEPA PROGRAM IN MARINE POLLUTION RESEARCH,
Environmental Protection Agency, Washington, DC. Office of Research and Development.
C. R. Gerber.
In: Proceedings of the International Symposium on Marine Pollution Research Held in Gulf Breeze, Florida on Jan 27-29, 1976, Environmental Protection Agency, Office of Research and Development Report No. EPA-600/9-76-032, January 1976. p 3-4.

Descriptors: *Water pollution, *Model studies, *Pollutant identification, *Water pollution effects, Resources development, Baseline studies, Environmental effects, Ecosystem, *Outer Continental Shelf.

Because the waters of the earth know no boundaries, the problem of marine pollution is necessarily global in scope. Tides, currents, atmosphere/ocean interactions and the impact of shipping make marine pollution an international dilemma which will require an international solution. In mounting such an effort, there is a need for identifying proper roles for many (as many as 114) multinational organizations which deal with the oceans. The United States Environmental Protection Agency is in the process of evaluating its research activities. One area of effort is to develop ecosystem models that can test and explain the effects of different classes of pollutants. This is the approach we must take if we are ever to get ahead in the control and abatement of pollution. We also need an integrated understanding so that we can make the necessary trade-offs between use and protection of ocean resources. (See also W78-06906) (Sinha-OEIS)
W78-06907

RESPONSIBILITIES FOR MARINE POLLUTION RESEARCH WITHIN FEDERAL AGENCIES OF THE UNITED STATES,
Environmental Research Lab., Gulf Breeze, FL.
N. L. Richards.
In: 'Proceedings of the International Symposium on Marine Pollution Research Held in Gulf Breeze, Florida on Jan 27-29, 1976,' Environmental Protection Agency, Office of Research and Development Report No. EPA-600/9-76-032, January 1976. p 5-11, 4 ref.

Descriptors: *Federal Government, *United States, *Resources development, *Coasts, Exploration, Oil pollution, Water quality control, Pollution abatement, Outer Continental Shelf, Petroleum development.

After giving a cursory overview of the characteristics of the coastal zone of the United States showing the flow patterns of major oceans, rivers, and currents along the 100,000 miles of United States coastline and the distribution of human population along the coastal zone, the author discusses how federal agencies interact even though they have different legislative mandates. The role of federal agencies which have major responsibilities in Outer Continental Shelf exploration and development of offshore oil and gas reserves is discussed specifically. (See also W78-06906) (Sinha-OEIS)
W78-06908

OVERVIEW OF MARINE POLLUTION RESEARCH IN THE BALTIC,
Institute of Meteorology and Water Management, Gdynia (Poland). Sea Dept.
K. Rozdzynski.
In: 'Proceedings of the International Symposium on Marine Pollution Research Held in Gulf Breeze, Florida on Jan 27-29, 1976,' Environmental Protection Agency, Office of Research and Development Report No EPA-600/9-76-032, January 1976. p 12-17, 2 fig.

Descriptors: *Water pollution, *Models, *Resources development, *Water quality control, Baseline studies, Environmental effects, Pollution abatement, Outer Continental Shelf, *Baltic Sea.

The Baltic Sea is an inland shelf sea of northern Europe and a part of the Atlantic Ocean, connected with the latter through the Danish Sounds and the North Sea. The planned rapid development of human activity in the Baltic area, the anticipated simultaneous industrial and urban development of the coastal area, the evolution of an offshore industry, growth of recreational needs and facilities as well as adaptation of special water areas for maricultural purposes, all serve to heighten the problem of environmental protection of this area. Regarding protection and evaluation of the Baltic Sea area as a task to be effectively realized only through common effort of all Baltic countries, Poland took the initiative to organize a Diplomatic Conference of Baltic countries in September 1973. Its outcome was the signing by all participating countries of the Convention on Fishing and Conservation of Living Resources in the Baltic Sea and the Belts. This act of international law was presented as precedent in the United Nations forum. The Baltic Sea and its drainage area are an outstanding example of a difficult area for scientific studies. On the other hand, it is an excellent, almost universal model basin for the study of pollution problems wherein all problems of twentieth century technical culture are brought into focus. (See also W78-06906) (Sinha-OEIS)
W78-06909

MARINE POLLUTION RESEARCH IN YUGOSLAVIA: AN OVERVIEW,
Institut Rudjer Boskovic, Zagreb (Yugoslavia). Center for Marine Research.
V. Pravdic.
In: 'Proceedings of the International Symposium on Marine Pollution Research Held in Gulf Breeze, Florida on Jan 27-29, 1976,' Environmental Protection Agency, Office of Research and Development Report No EPA-600/9-76-032, January 1976. p 18-28, 4 fig, 9 ref.

Descriptors: *Water pollution, *Resources development, *Research priorities, *Water quality control, Pollution abatement, Outer Continental Shelf, *Yugoslavia, *Adriatic Sea.

Pollution concern is of recent origin in Yugoslavia, mostly because modest industrial capacity, low per capita energy consumption and low density of motor vehicles have kept pollution at tolerable levels. Pollution is specifically threatening the northern bioproductive part of the Adriatic and the narrow channels between the islands, location of much intensive and economically important tourist industry. The dilemma of the urgent need for fast industrial and urban development and the preservation of the environment has caused pollution research to gain recognition as a vital part of regional development planning. The last few years have produced a wealth of information on dynamics of pollution processes in the area (much of it known from related research done in the Center for Marine Research). (See also W78-06906) (Sinha-OEIS)
W78-06910

OVERVIEW OF MARINE POLLUTION RESEARCH IN EGYPT,
Alexandria Inst. of Oceanography and Fisheries (Egypt).
S. K. El-Wakeel.
In: 'Proceedings of the International Symposium on Marine Pollution Research Held in Gulf Breeze, Florida and Jan 27-29, 1976,' Environmental Protection Agency, Office of Research and Development Report No EPA-600/9-76-032, January 1976. 28-32.

Descriptors: *Water pollution sources, *Water quality control, *Oil spills, *Industrial wastes, *Sewage, Chemical wastes, Resources development, Pollution abatement, *Egypt, Ocean outfalls, Tar balls, Research programs.

Several Egyptian institutions are involved with aquatic pollution problems, especially the Water Pollution Laboratory at the National Research Centre, Cairo. Their main areas of interest are water quality and industrial waste in the Nile and its tributaries. The untreated sewage of central Alexandria (over 2 million inhabitants) is discharged into the sea through a pipe constructed in 1954. There are, additionally, several emergency openings along the coastline. Thus, it is possible that the Alexandria beaches will be the first national recreation area to be polluted, with the anticipated effect on area seafood. One-third of Egypt's industrial activity is located in the Government of Alexandria where several factory complexes exist, mainly an oil refinery, paper mills, textile and cement manufacture, chemical industries and copper works. An oil pipeline terminal, connecting the Gulf of Suez with the Mediterranean, will reach the sea about 50 km west of Alexandria and will transport about 80 million tons annually, with a possible increase to 120 million tons. Although all precautions have been taken, there is still the possibility of oil spills at this site during loading operations. In view of this situation, two interinstitutional projects on aquatic pollution have been recommended to the Council of Environmental Research. They are: Effect of sewage disposal in the sea on the water quality along the beaches of Alexandria and pollution control in Lake Maryout. (See also W78-06906) (Sinha-OEIS)
W78-06911

OVERVIEW ON POLLUTION IN THE COASTAL ENVIRONMENT OF PAKISTAN AND ITS POSSIBLE IMPLICATION FOR THE MARINE ECOSYSTEM,
Karachi Univ. (Pakistan). Inst. of Marine Biology.
S. M. Haq.
In: 'Proceedings of the International Symposium on Marine Pollution Research Held in Gulf Breeze, Florida on Jan 27-29, 1976,' Environmental Protection Agency, Office of Research and Development Report No EPA-600/9-76-032, January 1976. p 33-54, 4 fig, 8 tab, 52 ref.

Descriptors: *Water pollution sources, *Water quality control, *Industrial wastes, *Sewage, *Oil pollution, Pollution abatement, Pesticides, Heavy metals, Estuaries, Coasts, *Pakistan, Resources management.

Pakistan has a 550-mile long coastline with more than 20,000 sq mi of area as part of the continental shelf. There is evidence that both natural factors and man's activities in the Karachi region are effecting drastic changes in its environment. To deal with problems of resource conservation and protection of coastal environments, it is imperative that, factors complementing the change be thoroughly examined. The Government of Pakistan, recognizing the importance of all types of pollution on human health and on future resources, has recently established a Man and Biosphere Committee at the national level. The object of this committee is to initiate steps to study various aspects of environmental hazards caused by human activities and to develop measures for controlling future environmental pollution. (See also W78-06906) (Sinha-OEIS)
W78-06912

OVERVIEWS ON MARINE POLLUTION IN INDIA,
University of West Florida, Pensacola. Dept. of Biology.
K. R. Rao.
In: 'Proceedings of the International Symposium on Marine Pollution Research Held in Gulf Breeze, Florida on Jan 27-29, 1976,' Environmental Protection Agency, Office of Research and Development Report No EPA-600/9-76-032, January 1976. p 54-59, 9 ref.

Descriptors: *Water pollution sources, *Resources development, *Planning, *Water quality control, Environmental effects, Legislation, Outer Continental Shelf, India.

India is the second most populous and the seventh largest country in the world. It has a coastline of 6,083km. Marine pollution is associated with the drainage of domestic and industrial wastes directly into coastal waters or indirectly via river waters. Since independence, India has launched and is making significant progress in programs for socio-economic development. Associated with the progress in industrial development and exploration of new energy reserves and pest control, there is evidence of environmental pollution. The belief that environmental disruption affects less developed countries in a lesser way is not well founded. Highly industrial pockets and overpopulated towns exist in the coastal areas, where marine pollution phenomena often appear with unparalleled intensity unless adequate preventive measures are adopted. Pollution is certainly a symptom of modernity which comes well in advance of other more desirable features of industrialization. Therefore, developing countries such as India have more opportunity to operate on a preventive basis than developed countries. (See also W78-06906) (Sinha-OEIS)
W78-06913

RESEARCH NEEDS CONCERNING POLLUTION OF THE MARINE BENTHOS,
Pacific Northwest Environmental Research Lab., Newport, OR. Marine Science Center.
R. C. Swartz.
In: 'Proceedings of the International Symposium on Marine Pollution Research Held in Gulf Breeze, Florida on Jan 27-29, 1976,' Environmental Protection Agency, Office of Research and Development Report No EPA-600/9-76-032, January 1976. p 60-68, 4 fig, 1 tab.

Descriptors: *Water pollution effects, *Benthos, *Bioindicators, Outer Continental Shelf, *Macrobenthic communities, Population structure, Research programs, Polychaeta.

Several research problems on the effects of pollution on the structure of macrobenthic communities are identified. Research needs are divided into two categories: (1) those associated with the development of methods for asssessing the 'health' of benthic ecosystems, and (2) those resulting from a lack of fundamental information concerning the relationship between community structure and pollutional stress. Obviously these research areas are closely related and individual projects can make contributions to both. (See also W78-06906) (Sinha-OEIS)
W78-06914

HYDROLOGICAL, CHEMICAL AND PHYSICAL PROCESSES AFFECTING POLLUTION OF THE BALTIC SEA,
Institute of Meteorology and Water Management, Gdynia (Poland).
For primary bibliographic entry see Field 5B.
W78-06915

INVESTIGATION OF POLLUTION-STRESSED LITTORAL COMMUNITIES IN THE NORTHERN ADRIATIC,
Institut Rudjer Boskovic Inst. Zagreb (Yugoslavia). Center for Marine Research.
For primary bibliographic entry see Field 5C.
W78-06916

RELATIONSHIP OF MARINE POLLUTION TO HUMAN HEALTH,
Environmental Protection Agency, Washington, D.C. Office of Research and Development.
For primary bibliographic entry see Field 5C.
W78-06918

DEVELOPMENT OF METHODS FOR RAPID DETECTION OF TRACE METALS IN SEA WATER,
Institut Rudjer Boskovic, Zagreb (Yugoslavia). Center for Marine Research.
For primary bibliographic entry see Field 5A.
W78-06919

EFFECT OF LEAD ON DINOPHYCEAE,
Biologische Anstalt Helgoland (West Germany).
For primary bibliographic entry see Field 5C.
W78-06920

BIOASSAYS AS INDICATORS OF POLLUTION EFFECTS,
Environmental Research Lab., Gulf Breeze, FL.
For primary bibliographic entry see Field 5A.
W78-06921

GLOBAL MONITORING OF MARINE POLLUTANTS,
Scripps Institution of Oceanography, La Jolla, CA.
For primary bibliographic entry see Field 5A.
W78-06922

APPLICATION OF DIGITAL PROFILE MODELING TECHNIQUES TO GROUNDWATER SOLUTE TRANSPORT AT BARSTOW, CALIFORNIA,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-06931

STRESS AND RECOVERY OF AQUATIC ORGANISMS AS RELATED TO HIGHWAY CONSTRUCTION ALONG TURTLE CREEK, BOONE COUNTY, WEST VIRGINIA,
Geological Survey, Charleston, WV. Water Resources Div.
For primary bibliographic entry see Field 4C.
W78-06933

EVALUATION OF HYDROGEOLOGIC ASPECTS OF PROPOSED SALINITY CONTROL PROGRAM IN PARADOX VALLEY, COLORADO,
Geological Survey, Denver, CO. Water Resources Div.
L. F. Konikow, and M. S. Bedinger.
Open-file report 78-27, January 1978. 23 p, 4 fig, 1 tab, 5 ref, append.

Descriptors: *Saline water intrusion, *Groundwater, *Effluents, *Seepage control, *Colorado River basin, Colorado, Streams, Planning, Aquifer management, Brines, Evaporation, Ponds, *Salinity control, *Paradox Valley(Colo), Dolores River.

The salt load in the Dolores River increases by about 200,000 tons per year where it crosses Paradox Valley, Colorado, because of the discharge of a sodium chloride brine from an underlying aquifer. A ground-water management program to nearly eliminate this major source of salt, which eventually enters the Colorado River, can be designed on the basis of an accurate description of the hydrogeologic framework of Paradox Valley. Probably the most economical plan would involve storage in an evaporation pond. The reservoir site must be large enough to provide an adequate evaporative surface over the life of the project, and be located and constructed to prevent brine contamination of other ground or surface waters either by seepage losses from the reservoir or by flood overflows. The proposed Radium Reservoir, located approximately 10 mi east of the Dolores River and between Paradox Valley and Gypsum Valley, would apparently serve as a satisfactory site for an evaporation pond. (Woodard-USGS)
W78-06942

OVERVIEW OF FEDERAL GROUNDWATER PROTECTION LEGISLATION AIDS ENVIRONMENTALISTS,
Office of Radiation Programs, Washington, DC Div. of Criteria and Standards.
R. K. Ballentine.
Water and Sewage Works, Vol. 125, No. 4, p 68-70, April, 1978. 1 fig.

Descriptors: *Federal Water Pollution Control Act, *Toxic Substances Control Act, *Resource Conservation and Recovery Act, *National Environmental Policy Act, Water pollution control, Legislation, Groundwater, Waste disposal, Hazardous wastes.

In reviewing the federal statutes on the topic of ground water quality protection, statutes other than the Safe Drinking Water Act which relate to this subject must also be identified. These statutes include: (1) Federal Water Pollution Control Act Amendments of 1972--ground water control not extensively includes. Sections 201, 208, 303, 304, and 402 have indirect bearing upon ground water pollution in their requirements for waste disposal planning and management. (2) Toxic Substances Control Act--provides framwork for regulation of hazardous waste disposal in or on land. (3) Resource Conservation and Recovery Act of 1976--further regulation of transport, storage, and disposal of hazardous wastes. (4) National Environmental Policy Act of 1969--indirect consideration of ground water via Environmental Impact Statements. Additional federal protection of ground water resources has come by way of Executive Orders 11514 and 11752. (Eberle-NWWA)
W78-06956

A SURVEY OF PRACTICES AND REGULATIONS FOR REUSE OF WATER BY GROUNDWATER RECHARGE,
SCS Engineers, Long Beach, CA.
For primary bibliographic entry see Field 5D.
W78-06958

HYDROGEN SULFIDE CONTROL,
Gulf South Research Inst., New Iberia, LA.
For primary bibliographic entry see Field 8G.
W78-06960

SICK WELLS REQUIRE WELL DEVELOPED CURE.
Irrigation Age, Vol. 12, No. 6, p 60-64, March, 1978. 3 tab.

Descriptors: *Irrigation, *Iron bacteria, *Incrustation, *Specific capacity, Maintenance, Rehabilitation, Chlorination, Acids, Water yield, Water wells.

Irrigators can save time and money by keeping accurate records of their wells and by taking remedial measures as soon as they notice decreases in specific capacity. Iron bacteria and mineral incrus-

tation are the two main problems causing decreases in irrigation well yield. The former can be minimized by chlorinating a well in the spring and fall. High-test dry calcium hypochlorite (H-T-H) or common household bleach can be used in quantities which can be calculated from tables in this article. Chlorine is introduced into the well, let stand, surged, then pumped out. After 24 hours, the well is surged and pumped once again. Incrustation is commonly treated wit sulfamic acid. The acidizing procedure is somewhat similar to chlorination, and it is suggested that chlorination both precede and follow an acid treatment. Enlisting the services of a well driller is recommended for treating wells with a decline in specific capacity greater than 20%. (Eberle-NWWA)
W78-06963

GEOTHERMAL DOWN-WELL PUMPING SYSTEM,
Sperry Research Center, Sudbury, MA.
For primary bibliographic entry see Field 8C.
W78-06969

LEGISLATIVE ASPECTS OF GROUNDWATER QUALITY,
A. H. Goodman, and M. J. Beckett.
In: Groundwater Quality--Measurement, Prediction and Protection. Proc. of the Water Research Centre Conference, September 6-8, 1976, Univ. of Reading, Berks., England, p 744-758. (1976) 1 ref.

Descriptors: *United Kingdom, *Legislation, *Water quality control, Groundwater, Waste disposal, Sewage disposal, Regulation, Permits, Water wells, Cemeteries.

Ground water legislation in Great Britain is discussed. Although approximately one third of public water supply in the U.K. is derived from ground water sources, little legislation is concerned directly with ground water protection, perhaps because serious incidents of subsurface contamination over the years have been surprisingly few. The Cemeteries Clauses Act of 1847 and the Public Health Acts of 1875, 1879, 1925 and 1936 regulated the construction of wells near burial grounds, specified sewage disposal practices, and delegated public well ownership and well closing authority to local levels. The Water Acts of 1945 and 1948, along with the Water Resources Act of 1963, laid down rules on licensing of wells and discharges to underground strata. Protection of ground water against pollution by waste disposal has been legislated more recently by the Deposit of Poisonous Wastes Act (1972) and the Control of Pollution Act (1974). Major provisions of the latter are the licensing of waste disposal sites and the accompaning mechanisms for site supervision by appropriate government authorities. The CP Act also provides for statutory consultations between waste disposal and water authorities where protection of water is concerned. (Eberle-NWWA)
W78-06974

MEASURES FOR THE PROTECTION AND REHABILITATION OF AQUIFERS IN THE UNITED KINGDOM,
H. G. Headworth, and W. B. Wilkinson.
In: Groundwater Quality--Measurement, Prediction and Protection. Proc. of the Water Research Centre Conference, September 6-8, 1976, Univ. of Reading, Berks., England, p 760-817. (1976) 12 fig, 3 tab, 77 ref.

Descriptors: *United Kingdom, *Aquifers, *Water pollution control, Rehabilitation, Water pollution sources, Sewage disposal, Agricultural chemicals, Industrial wastes, Spills, Coasts, Saline water intrusion, Mine wastes.

Although the groundwater resources of the United Kingdom have proved to be good quality water supplies over the years, it is likely that the increased environmental pressures of industrial development and latent effects of current polluting activities will mean an increase of reported well contaminations. In general, ground water pollution sources in Britain are the same as in the U.S. More stringent legal regulation of waste disposal activities and wider use of hydrogeological studies in assessing environmental impacts are obvious pollution control measures that should be implemented. Regarding technology, injection wells are not now used in either the waste water disposal sphere or for control of saline water intrusion via artificial recharge; they may, however, need to be employed in the future. Short general discussions of various sources of pollution are presented in this paper. Control and rehabilitation measures that may be adopted for existing and potential pollution situations are illustrated by a number of case histories. (Eberle-NWWA)
W78-06975

OIL SPILL AND OIL POLLUTION REPORTS, MAY 1977 - JULY 1977,
California Univ., Santa Barbara. Marine Science Inst.
P. Melvin, H. Ehrenspeck, and P. Nordin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 691, Price codes: A17 in paper copy, A01 in microfiche. Environmental Protection Agency, Office of Research and Development, Environmental Protection Technology Series No EPA-600/2-77-243, November 1977. 387 p, append. Grant R805052.

Descriptors: *Oil spills, *Oil pollution, *Water pollution sources, *Water pollution effects, *Bibliographies, Pollutant identification, Water quality control, Baseline studies, Resources development, Patents, Pollution abatement, *Outer Continental Shelf, Petroleum development, Oil transport, Coastal zone.

The May, 1977 - July, 1977 issue of Oil Spill and Oil Pollution Reports is a quarterly compilation of oil pollution publications and ongoing project summaries. Presented in the report are: (1) summaries and citations of published literature and patents; (b) summaries and status of current research projects; and (c) current oil-related conferences. (Sinha-OEIS)
W78-06980

EVALUATION OF TECHNIQUES FOR ALGAE REMOVAL FROM WASTEWATER STABILIZATION PONDS, REVIEW PAPER,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5D.
W78-06995

RECREATIONAL REUSE OF MUNICIPAL WASTEWATER--PHASE II,
Texas Tech Univ., Lubbock. Water Resources Center.
J. T. Bandy, D. M. Wells, and R. M. Sweazy.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 497, Price codes: A04 in paper copy, A01 in microfiche. Report No. WRC 77-2, June, 1977. 56 p, 13 fig, 17 tab, 61 ref. Supplement to Completion Report. OWRT C-6053(No 5205)(2).

Descriptors: *Water reuse, Planning, Texas, *Lubbock(Tex), *City planning, *Recreational lakes, Management, Water pollution control, Phosphorus, *Cycling nutrients, Eutrophication, *Model studies, *Algal growth control, Water pollution effects.

The city of Lubbock, Texas has long been a leader in the conception and implementation of water reuse plans. For more than 51 years the city's treated municipal effluent has been used for irrigation. Now it is planning to use recovered percolated effluent as makeup water for a series of small recreational lakes built within the city. To insure that this second beneficial reuse of the water will be successful, model studies have been conducted in which nine common-wall concrete ponds simulated the proposed lakes and in which a similar source of percolated reused effluent servied as makeup water. These model studies determined that the lakes will be suitable for fish life and for recreational contact but that careful management will be necessary if objectionable blooms of algae are to be avoided. Studies were also undertaken which established the critical phosphorus concentration for algal growth as well as the availability and probable manner of cycling of phosphorus within the lakes. These results will be valuable not only to the city of Lubbock in its operation of the lakes but also other municipalities which wish to derive maximum benefits from their limited water supplies. (See also W77-01824.)
W78-06997

EVALUATION OF FACTORS PROMOTING THE PRESERVATION OF AQUATIC ECOSYSTEMS IN RECLAIMED STRIP MINE AREAS,
Grover City Coll., PA. Dept. of Biology.
F. J. Brenner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 393, Price codes: A07 in paper copy, A01 in microfiche. Completion Report, January, 1978. 130 p, 4 tab, 31 fig, 47 ref. Institute for Research on Land and Water Resources, University Park, PA. OWRT A-044-PA(1), 14-34-0001-6039.

Descriptors: Preservation, Water chemistry, Plankton, *Algae, *Chlorophyll, Hydrogen ion concentration, Wildlife habitats, *Ecological surveys, Ecology, *Phytoplankton, Ecosystems, *Biomass, Seasonal, Zooplankton, *Productivity, C-14 uptake, Eutrophication, Water pollution, Aquatic ecosystems, *Reclaimed strip mines, Chemical parameters, Fish habitats.

An ecological survey was conducted on 82 different strip-mine areas including 132 different aquatic areas located within these lands. A detailed survey of the water chemistry, plankton population, algae biomass and chlorophyll concentration was conducted on 60 mines of various ages. Seasonal changes in these parameters in addition to light and dark bottle productivity and C-14 uptake studies were conducted on three aquatic areas located on the same mine operation. The results indicate that the seasonal changes in productivity were similar between these mines even though they differed in pH and other chemical parameters. The mathematical relationship between phytoplankton populations, algae biomass, chlorophyll and C-14 uptake indicate that the productivity of these areas may be predictable within a good degree of confidence. These unique ecosystems should be managed in order to enhance their potential as fish and wildlife habitats. (Sink-Penn St)
W78-06998

EFFECTS OF FUNGI AND BACTERIA ON THE DECLINE OF ARTHROPOD-DAMAGED WATERHYACINTH,
Florida Univ., Gainesville. Dept. of Plant Pathology.
For primary bibliographic entry see Field 4A.
W78-07002

BIOLOGICAL CONTROL OF WATER POLLUTION.
Pennsylvania Univ., Philadelphia. Center for Ecological Studies in Planning and Design.
For primary bibliographic entry see Field 5D.
W78-07003

PLEINS FEUX SUR LES EAUX ROUGES DE MONT-WRIGHT (RED WATER AND THE MOISIE RIVER).
Quebec Cartier Mining Co., Fermont.

Atlantic Salmon Journal, No. 1, p 21-32, 1978. (Text in both languages).

Descriptors: *Mine wastes, *Mine water, *Industrial wastes, *Suspended solids, Water quality, Salmon, *Atlantic salmon, Fry, *Growth stages, *Fish food organisms, Water pollution sources, Bioassay, *Moise River, Quebec, Canada.

The mining company responsible for the release of large quantities of suspended solids into the Moise River watershed presents an overview of methods it is utilizing to correct the problem. A new water treatment facility which will be capable of removing the suspended particles is presently under construction. The impact on salmon populations is also under investigation. (Deal-EIS)
W78-07023

EXPERIENCE WITH THE 303-208-201 STUDY RELATIONSHIPS,
Clinton Bogert Associates, Fort Lee, NJ.
F. Dobrowolski, and L. Grillo.
Water Resources Bulletin, Vol. 13, No. 3, p 455-460, June 1977.

Descriptors: *Water quality standards, *Costs, *Estimating, *Planning, *Non-point source control, Sewerage, *New Jersey, Regulation, Alternative evaluation, Process selection, Funding, NPDES permit, Municipal wastes.

The current 201 study by the Bergen County Sewer Authority illustrates possibilities for improving the currently defined relationships between 201, 208 and 303 studies. The Bergen County Sewer Authority serves 115 square miles in northeast New Jersey, providing sewerage service to 507,000 people in 43 municipalities. Its STP discharges to the Hackensack River, a tidal estuary recently classified as Water Quality Limited and which receives significant non-plant loading. The subject 201 study is concurrent with 208 and 303 planning by NJDEP. Preliminary evaluations show that detailed 201 work can affect the conclusions of 303 and 208 studies, and that a wider (environmental and social, as well as economic) interpretation of cost-effectiveness can demand reexamination of prior assumptions and decisions, a task not typically part of 208-303 work. Increased flexibility is needed in applying 303 and 208 recommendations to defining 201 studies and NPDES permit criteria, particularly in analysis of water use objectives, water quality parameters and future flows, loading and facility costs. Further, perception of alternatives can be clarified by broadening analysis of costs and control and plant strategies. Inclusion of 201 planning at all stages of regional planning can synergistically improve the total planning process. (Bell-Cornell)
W78-07038

PLANNING DIFFUSE POLLUTION CONTROL: AN ANALYTICAL FRAMEWORK,
Williams Coll., Williamstown, MA. Dept. of Economics.
R. R. Schneider.
Water Resources Research, Vol. 14, No. 2, p 322-336, April 1978. 4 fig, 2 tab, 39 ref.

Descriptors: *Planning, *Water pollution control, *Nonpoint pollution, *Analytical techniques, *Benefits, *Costs, Agriculture, Optimum development plans, Evaluation, Systems analysis.

Determination of an optimal nonpoint pollution control strategy demands information relating to (1) costs of pollutant reduction; (2) transport of pollutants, (3) water quality impact of pollutants, and (4) the economic impact of water quality changes. This paper briefly reviews the literature in each of these areas and suggests an analytical framework useful in the development of an optimal nonpoint pollutant control strategy. (Bell-Cornell)
W78-07042

WATER QUALITY SIMULATION AND PUBLIC LAW 92-500 CASE STUDY: SOUTHWESTERN ILLINOIS,
Hydrocomp Inc., Chicago, IL.
N. U. Schultz, and A. Wilmarth.
Water Resources Bulletin, Vol 14, No 2, p 275-287, April 1978. 5 fig, 4 tab, 2 ref.

Descriptors: *Water pollution control, Simulation analysis, *Comprehensive planning, *Regions, *Illinois, Stream, Reservoirs, Pollutants, Hydrologic aspects, Mathematical models, Systems analysis.

Section 208 of the Federal Water Pollution Control Act Amendments of 1972 has provided the Southwestern Illinois Metropolitan and Regional Planning Commission (SIMAPC) with a unique opportunity for comprehensive planning of the region's water quality. SIMAPC inititated the 208 study by researching available technology for the analysis of point and nonpoint sources of pollution and establishing criteria by which to judge the various techniques. This led to SIMAPC's choice of continuous simulation of stream and reservoir water quality as the most appropriate analytical tool for their needs. A continuous simulation model was calibrated and verified on three basins in the SIMAPC region. It was then used to produce load source analysis, pollution event frequency analysis, and pollution event duration analysis for ten pollutants under existing stream conditions and then under alternative future conditions. These results enabled the weighting of pollutant sources, analysis of the effectiveness of control measures, and quantitaive analysis of the marginal benefit of each alternative. (Bell-Cornell)
W78-07045

PLANNING MODELS WITH ALTERNATIVE COOLING SYSTEMS,
Middle East Technical Univ., Ankara (Turkey). Dept. of Environmental Engineering.
For primary bibliographic entry see Field 6A.
W78-07048

WATER RESOURCES AND NEGENTROPY,
National Research Center for Disaster Prevention, Tokyo (Japan).
For primary bibliographic entry see Field 2A.
W78-07054

BASIN-WIDE PLANNING FOR URBAN STORM-WATER MANAGEMENT,
Jorden (W. L.) and Co., Inc., Decatur. GA.
W. L. Jorden, and K. R. Jones.
In: Proceedings of the National Symposium on Urban Hydrology, Hydraulics, and Sediment Control, July 1976. UKY BU111, College of Engineering, University of Kentucky, Lexington, December 1976, p 11-23. 7 fig, 3 tab.

Descriptors: *River basins, *Storm water, *Management, *Drainage, *Programs, *Alternative planning, Georgia, Evaluation, Economics, Citizen attitudes, Legal complications, Regional analysis, Simulation analysis, Mathematical models.

With the acquisition of UROS-4, an urban runoff simulation computer program, Dekalb County, Georgia has initiated a program of basin-wide planning for stormwater management and drainage improvements. To gain experience in this planning process, a Pilot Sub-basin Drainage Program has been undertaken. Citizen attitudes, legal complications, funding alternatives, development of a coordinated drainage system, and implementation costs have been addressed under this program. A discussion of the study process is supported by the experience of DeKalb County and provides ideas for conducting similar programs elsewhere. (Bell-Cornell)
W78-07058

OVERFLOW ABATEMENT ALTERNATIVES SELECTED BY COMBINING CONTINUOUS AND SINGLE EVENT SIMULATIONS,
Dorsch Consult, Munich (Germany).
W. F. Geiger, S. A. LaBella, and G. C. McDonald.
In: Proceedings of the National Symposium on Urban Hydrology, Hydraulics, and Sediment Control, July 1976. UKY BU111, College of Engineering, University of Kentucky, Lexington, December 1976, p 71-79. 9 fig, 2 tab, 28 ref.

Descriptors: *Urban runoff, *Storm water, *Overflow, *Simulation analysis, *Pollution abatement, Urban drainage, Evaluation, Combined sewers, Statistical methods, Comparison, Alternative planning, Cost effectiveness, Waste water(Pollution), Land use, Networks, Mathematical models, Systems analysis.

A comparison of concepts and benefits of continuous and single event simulation models for urban runoff pollution analysis are briefly discussed and a procedure for relating continuous and single event simulations is presented. The procedure allows the evaluation and ranking of alternatives in an urban storm or combined sewer network study based on more detailed single event simulations while still utilizing the benefits of continuous simulations. Runoff and overflow characteristics for single event simulations are related to the statistical analysis of th continuous simulation, allowing a quick comparison of effectiveness and costs for the alternatives being considered. (Bell-Cornell)
W78-07059

PENN STATE RUNOFF MODEL FOR THE ANALYSIS OF TIMING OF SUBWATERSHED RESPONSE TO STORMS,
Weston (Roy F.), Inc., West Chester, PA.
D. F. Lakatos.
In: Proceedings of the National Symposium on Urban Hydrology, Hydraulics, and Sediment Control, University of Kentucky, July 1976. UKY BU111, College of Engineering, University of Kentucky, Lexington, December 1976, p 177-185. 5 fig, 1 tab, 4 ref.

Descriptors: *Runoff, *Timing, *Mathematical models, *Water pollution control, *Simulation analysis, Networks, Watersheds(Basins), Pollution abatement, Storm water, Computer programs, Systems analysis, Subarea runoff, Runoff combinations, Peak flow.

A runoff model has been developed to be used primarily for the analysis of subarea flow combinations, and more importantly for analyzing their effect on total runoff from an area. A significant savings can be realized with the logical placement of a network of small-scale runoff abatement devices in a watershed as opposed to the construction of one large reservoir at the watershed mouth for reducing the peak flow rate from the entire area. These smaller abatement devices can be functional or they can be in the form of, for example, dry ponds which can be used as small parks, except in times of flooding. Described is the Penn State Runoff Model, the most useful tool for performing a runoff timing study. This computer program was developed specifically for analyzing and illustrating subarea runoff combinations. The Peak Flow Presentation Table furnished as output from this model illustrates these runoff combinations. (Bell-Cornell)
W78-07060

ECONOMIC IMPLICATIONS OF ENVIRONMENTAL LEGISLATION FOR WETLANDS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6E.
W78-07080

TO MINE OR NOT TO MINE GROUNDWATER,
Illinois State Water Survey, Urbana.

For primary bibliographic entry see Field 4B.
W78-07102

INDUSTRIAL POLLUTION CONTROL: VOLUME 1: EXECUTIVE SUMMARY.
Stone (Ralph) and Co., Inc., Los Angeles, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 178, Price codes: A06 in paper copy, A01 in microfiche. April 1977. 105 p, 5 fig, 11 tab, 20 ref. AID-ta-C-1091.

Descriptors: *Industrial wastes, *Water pollution sources, *Water pollution control, *Waste water treatment, *Water quality control, *Cost-benefit analysis, *Cost analysis, Planning, Management.

Background information and reference sources are presented for the facilitation of general policy decisions relating to the control of industrial pollutants. Topics include (1) the social and economic costs of industrial pollution; (2) the ways in which society pays these costs; (3) the strategies government and industry can utilize to control polluting discharges; (4) the respective cost-benefits of industrial freedom to pollute and consequences of mandatory pollution control; and (5) public agency environmental information sources. The two-volume study is intended for use by government leaders, industrialists, and other concerned individuals who may have widely differing technical and national backgrounds. Volume 2 is concerned with the technical application and comparative costs of pollution abatement in manufacturing operations. The general principles and control methods discussed will generally be applicable to pollutants from both industrial and non-industrial sources. (See also W78-07120) (Seip-IPA)
W78-07119

INDUSTRIAL POLLUTION CONTROL: VOLUME 2: TECHNOLOGICAL STRATEGIES.
Stone (Ralph) and Co., Inc., Los Angeles, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 179, Price codes: A20 in paper copy, A01 in microfiche. April 1977. 451 p, 184 fig, 83 tab, 114 ref. AID-ta-C-1091.

Descriptors: *Industrial wastes, *Water pollution sources, *Water pollution control, *Waste water treatment, *Water quality control, *Air pollution, *Cost-benefit analysis, *Cost analysis, Analytical techniques, Equipment, Pollutant identification, *Technology.

Information on technologies commonly used for reducing the environmental impact of industrial air and water pollutants is presented and relative costs for removing different quantities of pollutants from industrial waste streams are indicated. Topics include: (1) pollution abatement approaches, which may supplement, facilitate, or replace end-of-pipe treatment processes; (2) the potential adverse effects of major air and water pollutants generated by industrial sources; (3) available techniques, processes, and equipment, which may be used separately or as parts of a system for removing or reducing pollutants in industrial discharges to the air and water environment; (4) pollutants generated by selected basic industries, and examples of suitable treatment systems for their control; (5) actual pollution abatement practices used by specific industrial plants in three case study industries; and (6) related economic data and cost curves. The two-volume study is intended for use by government leaders, industrialists, and other concerned individuals who may have widely differing technical and national backgrounds. Volume 1 provides background information and reference sources to facilitate general policy decisions relating to the control of industrial pollutants. The general principles and control methods discussed will usually be applicable to pollutants from both industrial and nonindustrial sources. (See also W78-07119) (Seip-IPA)
W78-07120

DESIGN GUIDE FOR METAL AND NON-METAL TAILINGS DISPOSAL,
Bureau of Mines, Spokane, WA. Spokane Mining Research Center.
For primary bibliographic entry see Field 5E.
W78-07123

1977 INTENSIVE WATER QUALITY SAMPLING PROGRAMS IN NORTH CENTRAL TEXAS.
North Central Texas Council of Governments, Arlington.
For primary bibliographic entry see Field 5A.
W78-07127

A SUMMARY OF THE 1977 ANNUAL WATER QUALITY MANAGEMENT PLAN FOR NORTH CENTRAL TEXAS.
North Central Texas Council of Governments, Arlington.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 173, Price codes: A03 in paper copy, A01 in microfiche. 1977. 32 p.

Descriptors: *Water quality, *Management, *Planning, *Sewage treatment, *Waste disposal, *Texas.

The North Central Texas Council of Governments is a 170-member voluntary association of cities, counties, school and special purpose districts in a 16-county metropolitan region, centered around Dallas and Fort Worth, with a population of 2.9 million and an area of 12,627 sq. mi. The 1977 Annual Water Quality Management Plan focuses on the management and planning activity of the region's vast network of waste collection and sewage treatment facilities. Also described are: (1) plan recommendations, (2) the 1977 Sewerage Improvements Program, (3) implementation of the Upper Trinity River Basin Comprehensive Sewerage Plan, (4) implementation of state treatment levels, (5) findings from the Waste Treatment Management Program, (6) impact analysis, (7) natural/environmental resources, (8) costs management and financing, and human activities, (9) public participation, (10) committees, (11) annual review process, and (12) ongoing planning during 1977-78. The 1977 Annual Plan consists of three volumes: I - Waste Treatment Management Program - assesses the degree to which the adopted regional sewerage plan recommendations and the state and national effluent quality goals are being implemented; II - Impact Analysis of the Waste Treatment; and III - Public Participation/Review Process - summarizes the public participation activities during 1976-77. (Seip-IPA)
W78-07128

QUALITY ASSURANCE PRACTICES AND PROCEDURES,
Environmental Protection Agency, Chicago, IL. Central Regional Lab.
For primary bibliographic entry see Field 5A.
W78-07129

ENVIRONMENTAL IMPACT OF LAND USE ON WATER QUALITY (PROGRESS REPORT), BLACK CREEK PROJECT, ALLEN COUNTY, INDIANA,
Allen County Soil and Water Conservation District, Fort Wayne, IN.
For primary bibliographic entry see Field 6G.
W78-07131

AN UNUSUAL PUMP TEST NEAR ESTERHAZY, SASKATCHEWAN,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
A. Vandenberg.
Technical Bulletin No. 102, 1978, 25 p, 17 fig, 3 tab, 10 ref.

Descriptors: *Pump testing, Solid wastes, *Liquid wastes, Sodium chloride, Groundwater, Freshwater, Aquifers, Brines, Hydrogeology, Geology, Stratigraphy, Piezometry, *Canada, Water pollution, *Esterhazy(Saskatchewan).

As part of a program to study possible contamination of the environment by leaching of waste brine from storage basins at a potash mine near Esterhazy, Saskatchewan, a series of pump tests was conducted in March 1971. A pump test of approximately 20 hours duration was run on each of seven test wells and the piezometric head recorded simultaneously in the other six wells; the length of the intervening nonpumping periods was between 27 and 75 h. The aquifer in which the observation wells were completed can be described as a semiconfined, buried bedrock-channel aquifer, with sand and gravel channel fill forming the aquifer body, and till forming the overlying, semiconfining bed. The location and thickness of the aquifer in the vicinity of the wells have been defined by the drilling of 91 stratigraphic test holes. The results of the comparison show that there is a large range of uncertainty in the expected drawdown after a prolonged period of pumping. Real drawdown in the test holes exhibited a sustained downward trend which was much stronger than in the model solutions. Reasons for this trend could be (1) a seasonal downward trend owing to causes extraneous to the pumping, or (2) strongly reduced permeability or absence of the buried valley deposits to the east of the study site or (3) less leakage than was assumed on the basis of the pump-test analysis. (WATDOC)
W78-07172

POTATO PROCESSING PLANT LIQUID EFFLUENT REGULATIONS AND GUIDELINES.
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
Regulations, Codes and Protocols Report EPS 1-WP-77-4, November, 1977. In English and French, 33 p., 38 p., 8 append.

Descriptors: *Liquid wastes, *Effluents, *Industrial wastes, *Potatoes, Industrial plants, Toxicity, Aquatic life, Fishkill, Water pollution effects, Water pollution control, Regulation, Water quality standards, *Canada.

This document contains potato processing plant liquid effluent regulations and guidelines, toxicity guidelines for potato plants and explanatory notes for the regulations and guidelines. The notes discuss the intent, meaning and basis of authority for the regulations and guidelines. Details of best practicable process and treatment technology and internal water use practices are outlined. Water usage, acute lethality limits, interpretation, offsite treatment facilities, deposit limits, composite sampling and analysis, flow measurement, testing frequency, effluent discharge, acute toxicity testing and production information are discussed. (WATDOC)
W78-07174

AN INVENTORY OF THE FRUIT AND VEGETABLE PROCESSING INDUSTRY IN CANADA,
Stanley Associates Engineering Ltd., Edmonton (Alberta).
Water Pollution Control Directorate, Environmental Protection Service, Fisheries and Environment Canada, Ottawa, Canada. Economic and Technical Review Report EPS 3-WP-78-2, February, 1978, 121 p., 2 fig, 66 tab, 2 append.

Descriptors: *Industrial production, *Industrial wastes, *Economic impact, *Environmental effects, *Surveys, Waste water treatment, Reduction(Chemical), Effluents, Technology, Analysis, Aerated lagoons, Anaerobic digestion, On-site

tests, Data collections, Evaluation, *Canada, Attitudes, *Fruits, *Vegetables, *Processing industries, Questionnaires.

Basic information on the economic and environmental aspects of the fruit and vegetable industry, excluding potato processing, was collected through questionnaires sent to all known fruit and vegetable processing plants in Canada, literature sources, and contacts with key members of the industry. The questionnaire responses have been analysed and combined with data obtained from Statistics Canada and other sources to present a total Canadian picture with respect to production, waste treatment techniques, and effluent loadings. Fruit and vegetable processing plants were divided into three categories according to size, based on annual production rates. These categories have been assessed separately in terms of environmental control methods and costs. The economic impact of upgrading wastewater treatment in each category has been evaluated in relation to the reductions in waste loadings that would result. (WATDOC)
W78-07177

ALGAL NUTRIENT LIMITATION IN LAKE ONTARIO AND TRIBUTARY WATERS,
Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.
For primary bibliographic entry see Field 5C.
W78-07189

HYGIENIC CHARACTERISTICS OF A NEW FLOCCULATION AGENT POLYETHYLENIMINE AND ITS STANDARDIZATION IN BODIES OF WATER (IN RUSSIAN),
Moskoviskii Gosudarstvennyi Meditsinskii Inst. (I) (USSR). Dept. of Public Hygiene.
For primary bibliographic entry see Field 5C.
W78-07196

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

AN ITERATIVE ALGORITHM FOR INTERACTIVE MULTIOBJECTIVE PROGRAMMING,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
S. P. Neuman, and R. Krzysztofowicz.
Advances in Water Resources, Vol 1, No 1, p 1-14, September 1977. 4 fig, 3 tab, 34 ref. OWRT B-051-ARIZ(1).

Descriptors: *Algorithms, *Multiobjective programming, *Optimization, *Lagrange multiplier, Decision making, Reservoir operation, Cost minimization, Water loss, Volume capacity, Equations, Mathematical models, Systems analysis.

A new iterative algorithm for interactive multiobjective programming is proposed. The algorithm is based on the Lagrange multiplier technique of generating noninferior solutions, and it is shown to converge under certain conditions. It reduces a complex multiobjective problem into a sequence of two-objective problems which the decision maker can more easily handle. The number of two objective problems with which the decision maker is confronted, as well as the total number of noninferior solutions that must be generated, increase more or less linearly with the number of objectives. Computational efficiency is further enhanced by avoiding the need for regression. The decision maker interacts with the model directly in the functional space, and he is not required to translate his judgment of relative worth into numbers. Due to the iterative nature of the algorithm, the decision maker can articulate his preferences in a progressive manner. Furthermore, he may modify his attitude at any stage of the computation, based on partial results, without adversely affecting the quality of the solution. An example problem involving efficient reservoir operation, previously solved by other methods, including the surrogate worth trade-off approach, is used to illustrate the new algorithm; the objective is to maximize volume capacity and to minimize capital cost and water loss. (Bell-Cornell)
W78-06739

COAL GASIFICATION AND WATER RESOURCES DEVELOPMENT,
Ohio State Univ., Columbus. Dept. of Civil Engineering.
For primary bibliographic entry see Field 3E.
W78-06740

SEASONAL AND STOCHASTIC FACTORS IN WATER PLANNING,
Utah Water Research Lab., Logan.
A. B. Bishop, and R. Narayanan.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. HY10, p 1159-1172, October 1977. 3 fig, 9 tab, 12 ref. OWRT B-097-UTAH(4), 14-31-0001-4133.

Descriptors: *Water resources, *Water costs, *Long-term planning, *Stochastic processes, *Water allocation(Policy), *Water supply, Optimization, Computer programs, Constraints, Waste water treatment, Treatment facilities, Seasonal, Annual, Economies of scale, Water requirements, Water utilization, Municipal water, Irrigation water, Industrial water, Environment, Equations, Mathematical models, Systems analysis, Cost minimization.

A transshipment model of water resources in a region is formulated. Three contrasting formulations of the water allocation model have been developed: linear versus nonlinear costs; annual versus seasonal time frame; and deterministic versus stochastic water supplies. The basic model is structured using nonlinear costs (by separable programming) for the objective function and solved for various combinations of annual or seasonal periods for water supply and demand, and deterministic or stochastic water supplies. Two levels of wastewater treatment are also specified corresponding to 1977 and 1983 requirements of PL 92-500. The results of the model runs give optimal allocations of water from available sources to meet use sector requirements over a planning horizon from 1975 to 2020. The total minimum cost of water supply and wastewater treatment is reduced by taking into account seasonality of water requirements. Incorporating the stochastic nature of supplies generally results in a shift to more reliable but higher cost sources. A comparison of the model solutions indicates that improved sizing and timing of facilities can be achieved considering the stochasticity of water supplies and seasonality of water uses. (Bell-Cornell)
W78-06741

NEW REQUIREMENTS FOR LOCAL UNITS OF GOVERNMENT IN WATER RESOURCES PLANNING: INSIGHTS FOR IMPLEMENTATION FROM RECENT WATER RESOURCES PLANNING RESEARCH,
Say (E. W.) and Associates, Inc., Chelsea, MI.
For primary bibliographic entry see Field 6E.
W78-06742

SENSITIVITY, RESPONSIVITY, STABILITY AND IRREVERSIBILITY AS MULTIPLE OBJECTIVES IN CIVIL SYSTEMS,
Case Western Reserve Univ., Cleveland, OH.
Y. Y. Haimes, and W. A. Hall.
Advances in Water Resources, Vol. 1, No. 2, p 71-81, December 1977. 3 fig, 1 tab, 28 ref. OWRT C-7047(6221)(2), 14-34-0001-6221.

Descriptors: *Water resources, *Risk, *Optimization, *Multiple objectives, Surrogate Worth Trade-off method, Management, Planning, Decision making, Hydrology, Constraints, Economics, Costs, Error, Sensitivity, Mathematical models, Systems analysis, Equations.

Recommended is the consideration of sensitivity, stability, risk, and irreversibility as objective functions in water resource management models within the framework of multiobjective analysis. Six major sources of uncertainties and errors in systems modeling are identified. They are associated with the following model characteristics: model structure (topology), model parameters, model scope or focus, data, optimization technique, and human subjectivity. In particular, the major objective is to set the stage for the development of an analytical and operational multiobjective framework which will provide decision-makers and planners with alternatives that consider systems' sensitivity, responsivity, stability and irreversibility along with cost and other performance indices as multiple objectives. This type of a framework should have a very wide spectrum of applications in water and related land resources, environmental studies, energy, and others. The Surrogate Worth Trade-off method is proposed for the solution of the resulting multiobjective optimization problem. (Bell-Cornell)
W78-06743

INCOMMENSURABLES AND TRADEOFFS IN WATER RESOURCES PLANNING,
Florida Univ., Gainesville. Dept. of Food and Resources Economics.
G. D. Lynne.
Water Resources Bulletin, Vol. 12, No. 6, p 93-105, December 1976. 3 fig, 3 tab, 14 ref. OWRT B-022-ORE(2).

Descriptors: *Planning, *Multiple purpose, *Multiple objective problem, *Water resource development, *Analytical techniques, Alternative planning, Tradeoffs, Model studies, Resource allocation, Neoclassical economic model, Prices, *North Dakota, Dams, Reservoirs.

The neoclassical purely-competitive economic model is proposed as the correct framework for analyzing the problem which arises from lack of a common unit for measuring achievement of multiple objectives in water resource development. Tradeoffs can be calculated on the production side and provided to decision-makers; when a decision has been made, estimates of the relative value of non-monetary goods can be provided. A hypothetical example of the correct approach to the multiple objective problem is given, based in part of actual data for the proposed Bronco dam and reservoir complex in western North Dakota. Several authors have apparently misunderstood the true nature of tradeoff analysis, which has resulted in errors. The Marglin (1967), Major (1969-1970), Marshall (1973), and Water Resources Council (1971) approaches are evaluated and found inconsistent with the conceptual model presented here. Models presented by DeVine (1966) and McKean (1958), on the other hand, are acceptable. It is concluded that distortion in estimates will occur until the conceptual lessons of this paper are learned and applied. Among these are that (1) the relevant tradeoffs in multiple objective planning are, in fact, price ratios; and (2) tradeoffs cannot be calculated between and among alternative plans for development that have different costs and still be used to reflect relative values. (Lynch-Wisconsin)
W78-06746

AN ANALYSIS OF FEDERAL WATER RESOURCE PLANNING AND EVALUATION PROCEDURES,
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 6B.
W78-06772

ECONOMIC AND TECHNICAL CONSIDERATIONS OF REGIONAL WATER SUPPLY,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 6B.
W78-06784

STUDIES OF PUBLIC PREFERENCES AND GROUP INTERACTIONS TO GUIDE LAND-USE PLANNING AND CONTROL,
Iowa State Univ., Ames. Dept. of Sociology.
For primary bibliographic entry see Field 6B.
W78-06812

WATER QUALITY STANDARDS AND COMMUNITY VIABILITY,
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-06818

BUREAU OF RECLAMATION ECONOMIC ASSESSMENT MODEL (BREAM), TECHNICAL DESCRIPTION.
Mountain West Research, Inc., Tempe, AZ.
Bureau of Reclamation, Engineering and Research Center, Denver, Colorado. Technical Report, January 1978. 94 p, 6 fig, 14 tab, 10 ref, append. Bur Reclam 7-07-DR-50180.

Descriptors: Cohort-survival, Economics, *Economic simulation, Construction impact assessment, Water resource development projects, Local-nonlocal construction workers, Labor market, Migration(Labor), Bureau of Reclamation, *Evaluation, *Model studies, *Economic models.

A technical description is provided of the Bureau of Reclamation Economic Assessment Model (BREAM). The description presumes familiarity with the discussion of methodological issues and recommended procedures in the Economic/Demographic Assessment Manual published by the Bureau in November 1977. (See W78-02274) The purpose of this document is to provide the potential user with a sufficiently detailed description of the logic of the model and of the quantitative relationships on which it is based so that its usefulness can be realistically evaluated. (Bur Reclam)
W78-06903

WATER QUALITY SIMULATION AND PUBLIC LAW 92-500 CASE STUDY: SOUTHWESTERN ILLINOIS,
Hydrocomp Inc., Chicago, IL.
For primary bibliographic entry see Field 5G.
W78-07045

WATER RESOURCES MODELING AND OPTIMIZATION BASED ON CONSERVATION AND FLOODING POOLS,
Kansas State Univ., Manhattan. Dept. of Industrial Engineering.
E. S. Lee, and G. Nadimuthu.
Water Resources Bulletin, Vol 14, No 2, p 404-408, April 1978. 5 equ, 8 ref.

Descriptors: *Water resources, *Optimization, *Multiple-purpose reservoirs, *Constraints, *Material balance, Lagrange multiplier, Conservation pool, Flood pool, Water storage, Benefit maximization, Equations, Mathematical models, Systems analysis.

A new and practical concept in water resources modeling and optimization is introduced. Instead of unrealistically assuming a multipurpose reservoir to be composed of a single lumped pool of water, it is treated as two different pools, namely conservation and flood pools. Based on this treatment, the optimization problem is stated using the concepts of Lagrange multipliers and parameter optimization. The optimization problem of the material balance equation, the constraints on control and state variables, and the objective function of benefit maximization. (Bell-Cornell)
W78-07046

PLANNING MODELS WITH ALTERNATIVE COOLING SYSTEMS,
Middle East Technical Univ., Ankara (Turkey). Dept. of Environmental Engineering.
S. G. Velioglu, and E. D. Brill.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 104, No P02, p 141-156, April 1978. 5 fig, 3 tab, 22 ref, append.

Descriptors: *Water resources, *Powerplants, *Energy, *Mathematical programming, Optimization, Cost minimization, Linear programming, Nonlinear programming, Equations, Computer models, Parametric analysis, Rivers, *Cooling systems, Regions, Planning, Natural resources, Systems analysis, *Illinois.

Two approaches are presented for incorporating alternative cooling technologies into mathematical programming models for use in planning energy and water resources systems. The first approach allows a constant water requirement per unit power output for each cooling alternative; simple linear relationships result, and they can easily be incorporated into any linear allocation-location model, and this is demonstrated for Illinois. The second approach allows the water requirement to vary for each of the different cooling alternatives. A nonlinear model is produced, and a pratical separable-programming method is suggested for solution; this method is demonstrated for a 14-county region in Illinois. The objective function used in each approach is cost minimization. (Bell-Cornell)
W78-07048

A METHODOLOGY FOR OUTDOOR RECREATION ANALYSIS IN A STATE WATER RESOURCES PLANNING STUDY,
Geological Survey, Menlo Park. CA. Environmental and Safety Section.
For primary bibliographic entry see Field 6B.
W78-07049

BASIN-WIDE PLANNING FOR URBAN STORMWATER MANAGEMENT,
Jorden (W. L.) and Co., Inc., Decatur. GA.
For primary bibliographic entry see Field 5G.
W78-07058

6B. Evaluation Process

OPERATION OF THE NATIONAL WILDLIFE REFUGE SYSTEM (FINAL ENVIRONMENTAL STATEMENT).
Fish and Wildlife Service, Washington, DC.
For primary bibliographic entry see Field 6G.
W78-06703

AN ITERATIVE ALGORITHM FOR INTERACTIVE MULTIOBJECTIVE PROGRAMMING,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 6A.
W78-06739

SEASONAL AND STOCHASTIC FACTORS IN WATER PLANNING,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 6A.
W78-06741

SENSITIVITY, RESPONSIVITY, STABILITY AND IRREVERSIBILITY AS MULTIPLE OBJECTIVES IN CIVIL SYSTEMS,
Case Western Reserve Univ., Cleveland, OH.
For primary bibliographic entry see Field 6A.
W78-06743

INCOMMENSURABLES AND TRADEOFFS IN WATER RESOURCES PLANNING,
Florida Univ., Gainesville. Dept. of Food and Resources Economics.
For primary bibliographic entry see Field 6A.
W78-06746

A GUIDE TO ENVIRONMENTAL BENEFITS ASSESSMENT IN ECONOMIC IMPACT STUDIES.
Governors State Univ., Park Forest South, IL. Environmental Management Program.
Illinois Institute for Environmental Quality IIEQ Document No. 77/32, October, 1977. 450 p, 57 fig, 16 tab, 170 ref, 14 append, 80.042.

Descriptors: *Environmental effects, *Economic impact, *Pollution abatement, *Illinois, Benefits, Regulation, Standards, *Economic impact studies, *Benefits assessment, Illinois Public Act 79-790.

Environmental benefits of pollution control are considered. Two audiences are addressed: (1) those generally interested and/or involved in the benefits assessment process, but with little or no technical background, and (2) those involved in the preparation and evaluation of economic impact studies. A systematic organizing framework for benefits assessment was developed. Chapters summarize key aspects of each major stage in the process. Detailed technical material is provided in the appendices. (Seip-IPA)
W78-06755

ECONOMIC IMPACT OF PROPOSED AMENDMENTS TO MERCURY EFFLUENT STANDARDS IN ILLINOIS (R 76-17) (R 76-21),
Southern Illinois Univ. at Carbondale.
For primary bibliographic entry see Field 5G.
W78-06759

MISSOURI RIVER BASIN, STATE AND FEDERAL WATER AND RELATED LAND RESOURCE PROGRAMS, FISCAL YEARS 1978-1982.
Missouri River Basin Commission, Omaha, NE.
For primary bibliographic entry see Field 6E.
W78-06771

AN ANALYSIS OF FEDERAL WATER RESOURCE PLANNING AND EVALUATION PROCEDURES,
Michigan Univ., Ann Arbor. School of Natural Resources.
G. Schramm, and R. E. Burt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 498, Price codes: A06 in paper copy, A01 in microfiche. June 1970, 105 p, 12 tab, 1 fig, 4 append.

Descriptors: *Water resources, *Planning, *Projects, *Evaluation, *Formulation, Benefits, Costs, Environmental impacts, Income, Economics, Regional income, Multiple-purpose planning, Keelersburg Project(PA).

The study tests a set of new water resources plan and project evaluation procedures published under the title: Report to the Water Resources Council by the Special Task Force, Procedures for Evaluation of Water and Related Land Resource Project, U.S. Water Resources Council, Washington, June 1969. Broader objectives for water resources planning are developed by a four-account display system showing: (1) national income benefits and costs; (2) regional income benefits and costs; (3)

environmental objectives and consequences; and (4) social well-being objectives and consequences. Ways and means are suggested to permit trade-offs between the various accounts and objectives. Finally plan formulation is addressed, including: a discussion of multiple-purpose-multiple means planning; basic planning elements; space and time dimensions; income maximization; goal formulation; and the impact accounting system. A discussion of the environmental alternatives for the Keelersburg Project on the Susquehanna River, Pennsylvania, is presented as part of the Environmental Account appendix. The project was used as a focal part of the investigation but because the project was never seriously considered and there was the investigation but because the project was never seriously considered and there was therefore a lack of detailed data, no attempt was made to use it as a specific case study approach for the analysis in the report. (Zayac-NC)
W78-06772

A METHODOLOGY FOR PREPARING ENVIRONMENTAL ASSESSMENTS,
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 6G.
W78-06775

METHODOLOGY TO EVALUATE ALTERNATIVE COASTAL ZONE MANAGEMENT POLICIES: APPLICATION IN THE TEXAS COASTAL ZONE, SPECIAL REPORT IV: INSTITUTIONAL IMPACT OF ALTERNATIVE COASTAL ZONE MANAGEMENT SYSTEMS,
Lyndon B. Johnson School of Public Affairs, Austin, TX.
K. E. Haynes.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 191, Price codes: A04 in paper copy, A01 in microfiche. Report No 12, (1977). 63 p, 2 fig, 8 append. (NSF/RA-760260).

Descriptors: *Coasts, *Resources development, *Institutional constraints, *Legal aspects, *Texas, Planning, Land use, Legislation, Monitoring, Management, Permits, Institutions, Jurisdiction, *Coastal management program, Enforcement, Regional planning, Citizen participation, National Oceanographic and Atmospheric Administration.

This study's main objective was to gather data which would reveal present and potential problems concerning: coastal resource users such as industry, commerce, utilities, developers, and tourists; and the agencies, institutions, and organizations operating in or having an impact on the coast, including questions of jurisdiction, legislation and legal requirements, planning and coordination, monitoring, and enforcement policies and procedures. The study recommends that Texas should implement a coastal management program: should adopt a one stop permit procedure for coastal developments; should facilitate public participation in decisions which affect the coastal zone; must accommodate responsibilities of federal, state, and local agencies in any coastal zone plan or program; should meet the federal criteria set forth by National Oceanographic and Atmospheric Administration (NOAA) in a coastal zone management plan; should adopt a regional approach to coastal management due to the interdependencies of the coastal environment; and must assess alternative institutional arrangements in terms of their relative abilities to mesh with the political realities of the state, as well as with state and federal requirements. This report is part of a larger study designed to develop a methodology for evaluation of the economic and environmental impacts of alternative coastal zone management policies. (Nessa-NC)
W78-06777

PUBLIC BEHAVIOR AND ATTITUDES IN RESPONSE TO REPORTED HAZARDOUS DRINKING WATER. A FEASIBILITY STUDY,
Minnesota Univ., Duluth. Dept. of Sociology and Anthropology.
For primary bibliographic entry see Field 5G.
W78-06779

RECREATIONAL POTENTIAL ALONG THE LOUISIANA COAST: PROPOSED NEW AND EXPANDED SITES FOR RECREATION.
Burke and Associates, Inc., New Orleans, LA. Environmental Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 938, Price codes: A03 in paper copy, A01 in microfiche. Prepared for National Oceanic and Atmospheric Administration, Office of Coastal Zone Management, and Louisiana State Planning Office, Coastal Resources Program, February, 1977, 9 p.

Descriptors: *Recreation facilities, *Louisiana, *Outdoor recreation, *Coasts, Levees, Piers, Spoil banks, Beaches, Swamps, Access routes, Land use, Coastal zone management.

A tabulation is presented of recommendations, arranged by parish, for both expansion of existing facilities and potential new sites in areas where facilities are nonexistent. Potential new recreational sites include levees and battures, fishing piers, spoil banks along certain waterways, selected private beaches, salt domes, chenier ridges, and swamp parks. Sites have been recommended with the goal of providing additional recreational opportunities to areas that can withstand additional use. Providing access or facilities in previously remote natural areas should be carefully controlled so as not to subject sensitive areas to overuse. No sites have been recommended that would encourage development in remote areas. The list identifies the recommended sites by name, describes the type of facility proposed, and refers to the source and corresponding map number on the accompanying map of Potential Recreation Areas. The sources for these recommendations are the Statewide Comprehensive Outdoor Recreation Plan for 1975-80, field investigations, the Governor's Commission on the Atchafalaya Basin, future recreation sites projected by the coastal Regional Planning Commissions, U.S. Army Corps of Engineers, New Orleans District, and questionnaires set to parish officials. (Nessa-NC)
W78-06783

ECONOMIC AND TECHNICAL CONSIDERATIONS OF REGIONAL WATER SUPPLY,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
G. Aron, and S. P. Coelen.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A045 105, Price codes: A10 in paper copy, A01 in microfiche. Prepared for U.S. Army Engineer Institute for Water Resources, IWR Contract Report 77-7, July 1977, 199 p, 32 fig, 23 tab, 68 ref, 2 append. DACW31-75-C-0018.

Descriptors: *Water supply, *Regional analysis, *Methodology, *Inter-basin transfers, Efficiencies, Equity, Econometrics, Land use, Reservoirs, Economics, Delaware River, Model studies, *Extension regionalization, Integration regionalization, *Regional water supply, Land values, Reservoir integration, Susquehanna River.

The concept of regionalization was studied in view of the growing belief that it is the key solution of American water supply (and wastewater treatment) problems. Believing that too little research has been devoted to the questions of regionalization, the study attempts to provide a methodological background for those considering regionalization in practice. Two tools of regionalization implementation are identified: integration and extension. Because regionlization by integration does not spill over into other markets, while regionalization by extension involves both water and property markets, thus making analysis of integration regionalization much less complex than that of extension regionalization, the study concentrates on two themes: (1) efficiency of plans for regional integration; and (2) the distributional interbasin water transfers and introduces an econometric model as a tool for evaluating changes in land value arising from water supply regionalization. The report finds that most regionalization plans have failed, not only because of political and institutional difficulties, but also because problems of efficiency and equity were not resolved. (Zayac-NC)
W78-06784

EVALUATION OF PLANNING FOR FISH AND WILDLIFE: JOHN REDMOND RESERVOIR PROJECT.
Sport Fishing Inst., Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A034 136, Price codes: A03 in paper copy, A01 in microfiche. Prepared for Army Corps of Engineers, Chief of Engineers Office, Interim Report, June 1976, 41 p, 8 tab, 1 fig, 27 ref. DACW73-74-0040.

Descriptors: *Evaluation, *Fish, *Wildlife, *Project planning, *Management, Hunting, Fishing, Forecasting, Land use, Multiple-purpose projects, Water resources development, Kansas, *Projections, *John Redmond Reservoir(KA), Lyon County(KA), Coffey County(KA), Grand River(KA).

This study's purpose was to compare the original projections of activities associated with fish and wildlife with the actual activities. The study area involves the John Redmond Reservoir and surrounding lands in Lyon and Coffey Counties, Kansas. The total project area is 12,829 hectares (ha), and the Reservoir itself is 3,804 ha. Post-impoundment surveys indicate that the project annually supports waterfowl hunting in excess of the prediction by 300% and upland game hunting 400% in excess of the prediction. Use of the project by migratory waterfowl was as expected for ducks, but was only 20% of the expected level for geese. The qualitative fisheries predictions were generally accurate. The predicted volume of angling was about 38% higher than the actual angler presure of 1974. The post-impoundment angling use in the Grand (Neosho) River below the Reservoir was four times the predicted value. The project evaluation prepared by the Fish and Wildlife Service (FWS) in 1961 was perfunctory. Reports prepared in 1963 by the FWS to justify authorization of the national wildlife refuge on the reservoir land were more comprehensive. (Nessa-NC)
W78-06789

EVALUATION OF PLANNING FOR FISH AND WILDLIFE: LITTLEVILLE RESERVOIR.
Sport Fishing Inst., Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A038 823, Price codes: A03 in paper copy, A01 in microfiche. Prepared for Army Corps of Engineers, Chief of Engineers, October 1976, 29 p, 3 tab, 1 fig, 16 ref. DACW73-74-C-0040.

Descriptors: *Fish, *Wildlife, *Project planning, *Management, *Multiple purpose projects, Water resources development, *Reservoirs, *Reservoir fisheries, Evaluation, Projections, Hunting, Fishing, Forecasting, Land use, *Massachusetts, *Littleville Reservoir(MA), *Middle Branch Westfield River(MA), Chester(MA), Huntington(MA).

This study's purpose was to compare the original projections of activities associated with fish and wildlife with the actual activities. The Littleville Reservoir study area is located on the Middle

Branch of the Westfield River within the towns of Chester and Huntington, Massachusetts. The reservoir, built to provide flood control and water supply benefits, covers 111 hectares (ha) at water supply elevation and 206 ha at full flood pool. The total project includes 680 ha of land and water. In their 1961 planning report, the Fish and Wildlife Service (FWS) recommended that hunting be permitted on project lands without recommending alternative action if the lands should be closed to hunting. Thus, the closing of the project lands by the city of Springfield resulted in an uncompensated loss of hunting potential. It was anticipated that the locally important trout fishery on the Middle Branch would be replaced by a reservoir trout fishery. The Corps of Engineers (CE) estimate of angling pressure averaged 2.7 times greater than the state estimates and 2.2 times greater than actual use. The FWS report did not adequately consider the downstream fishery resource, except for a cold water release request that the CE did not provide. Cooperation and coordination between state and Federal agencies were inadequate before and after the reservoir's construction. (Nessa-NC)
W78-06790

RECREATIONAL ADEQUACY OF BEACH ACTIVITY AND COMPARATIVE REGULATING INFLUENCES,
Rhode Island Univ., Kingston. Sea Grant Program; and Rhode Island Univ., Kingston. Dept. of Sociology.
I. A. Spaulding.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 426, Price codes: A03 in paper copy, A01 in microfiche. Marine Technical Report 47, November 1977, 48 p, 13 tab, 3 appendices, 17 ref.

Descriptors: *Beaches, *Recreational facilities, *Psychological aspects, *Behavior, Attitudes, Planning, Recreation demand, Social aspects, *Euphoria-tension index, *Regulating influences, Beach activities, Beach development, Occupation classification.

The report seeks to summarize people's experiences on a beach that might prove useful in designing beaches and to planning for their use and management. Two characteristics are studied: the difference between tension levels at work and tension levels while engaged in beach activity; and influences that natural events, other people, personal feelings and mechanistic devices have both on work and on beach activities. The first has a bearing on the recreation adequacy of the beach experience, and the second has relevance for the use of space. An undeveloped beach provides the setting for user interviews. The data are analyzed for respondents classified by occupation. Measurements show tension levels to be lower during beach activity; and that work tends to be more influenced by personal feelings and other people than by mechanistic devices and natural events. Also, the influences of personal feelings and natural events are greater on beach activity than on work, while the influences of mechanistic devices and other people are greater on work than on beach activity. The report's results should provide a basis for comparing beaches of varying types and degrees of development. Implicit in the study is the assumption that beach development is capable of varying environmental influences on activity and of modifying the recreational effectiveness of beach experience. (Zayac-NC)
W78-06791

DESIGN AND METHOD OF THE SOCIOLOGICAL RESEARCH IN THE GRAND CANYON RIVER CONTACT STUDY. PART I,
Human Ecology Research Services, Inc., Boulder, CO.
B. Shelby, and J. M. Nielson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 760. Price codes: A06 in paper copy, A01 in microfiche. Prepared for Grand Canyon National Park, AZ, June 1976, 91 p, 5 ref, 6 tab, 4 appendices. CX821040104.

Descriptors: *Colorado River, *Recreation, *Social aspects, Management, National recreation areas, Boating, Psychological aspects, Behavior, *Use rates, *Grand Canyon, *River use alternatives, Rafting, Management alternatives, *Wilderness use.

The aim of this study, reported in 4 volumes, was to assess the effects of different management alternatives on the nature and quality of the river experience on the Colorado River through the Grand Canyon. This volume, Part I, has as its focus methods for collecting sociological data for analysis of private/commercial and motor/oar raft trips of the river. Data used included random selection of the following sources: user interviews and questionnaires; trip reports; and park service records of use. Response rates for each data source are discussed and analyzed for their applicability. Three variables are then isolated as crucial for further analysis in subsequent volumes: use level, mode of propulsion, and trip type (private or commercial). (See also W78-04151 and W78-06794) (Zayac-NC)
W78-06793

USE LEVELS AND CROWDING IN THE GRAND CANYON. RIVER CONTACT STUDY. PART III,
Human Ecology Research Services, Inc., Boulder, CO.
B. Shelby, and J. M. Nielsen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 745, Price codes: A04 in paper copy, A01 in microfiche. Prepared for Grand Canyon National Park, Arizona-Colorado River Research Program, June 1976, 51 p, 25 tab, 1 fig, 8 ref.

Descriptors: *Recreation demand, *Colorado River, *Management, *Use rates, Recreation, Simulation analysis, Boating, Behavior, Psychological aspects, Reasonable use, Social aspects, *Grand Canyon, *Wilderness use, *River use alternatives, Rafting.

This volume is part of a study initiated by the National Park Service in 1974 to assess the sociological effects of different management alternatives on the nature and quality of the river experience in the Grand Canyon. This report investigates the question of how wilderness users affect one another. Since the opportunity for solitude is of primary import for wilderness users, the study attempts to determine the number of people for whom a high quality experience can be provided. The study found that most river travelers (90%) define the Grand Canyon and their trip in terms of wilderness, with satisfaction levels running to 85%. No consensus was found as to how crowded the Canyon should be. Variables of trip satisfaction were found to be personal benefits, social atmosphere and wilderness character. Conclusions were: management should control contacts among groups: an effort should be made to define 'appropriate' contact levels; and that since use tends to be concentrated by area and time, scheduling through the help of a simulation model would aid in maximizing total use while minimizing crowding. (See also W78-04151 and W78-06793) (Zayac-NC)
W78-06794

PUBLIC PARTICIPATION IN WATER RESOURCES PLANNING: A CASE STUDY AND LITERATURE REVIEW,
Massachusetts Univ., Amherst. Water Resources Research Center.
M. O. Ertel, and S. G. Koch.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 968. Price codes: A04 in paper copy, A01 in microfiche. WRRC Publication No 89, July 1977. 55 p, 4 tab, 1 fig, 58 ref. OWRT B-050-MASS(1).

Descriptors: *Planning, Public opinion, Reviews, New England, Decision making, *Social participation, *Attitudes, *Citizen participation, *Connecticut River, Social values, River Basin Commissions, *Interstate Commissions, *Literature reviews, *New England River Basins Commission, *Public participation.

Results are presented of the concluding phase of a four-year project that has analyzed and evaluated the public participation programs of three Level B Planning Studies conducted by the New England River Basins Commission. In this phase, the members of the Citizen Advisory Group to one of those Studies, the Connecticut River Basin Program, were surveyed to determine what modifications in attitudes toward the advisory process and the planning objectives had occurred since a similar survey was conducted in the first phase of the project. The first section includes the findings of this survey plus a discussion of other developments related to the activities of this advisory group. The second section is a review and assessment of significant literature on the theory and practice of public participation in water resources planning. (Idoine-Mass)
W78-06809

STUDIES OF PUBLIC PREFERENCES AND GROUP INTERACTIONS TO GUIDE LAND-USE PLANNING AND CONTROL,
Iowa State Univ., Ames. Dept. of Sociology.
G. L. Bultena, and D. L. Rogers.
Report Presented at the Iowa State University Faculty Symposium on Land-Use Planning and Control, 1973. 29 p, 45 ref. OWRT B-020-IA(4).

Descriptors: *Land use, *Planning, *Administration, *Decision making, Model studies, Attitudes, Social participation, *Public interest groups, Analytical models, *Citizen participation.

The role citizen involvement in future land-use planning is discussed. An organizational-expertise decision-making model is characterized by a division of complex activities into smaller operations; these operations are performed by subunits comprised of specialists. Advantages and limitations of the model are detailed. An alternative model, the democratic-participatory model, seeks expanded citizen involvement in public environmental programs; administration is structured so as to optimize input from citizens. Approaches to public participation, including public hearings, citizen advisory panels, and public opinion polls, are outlined. The power relationships between agencies and interest groups are analyzed; the need for cohesive, organized group efforts by public interests groups is stressed. A brief historical perspective of public interests groups is stressed. A brief historical perspective of public sentiment toward and citizen's priorities in the management of resources is presented. (Seip-IPA)
W78-06812

CONSIDERATIONS IN DETERMINING THE PUBLIC INTEREST,
Iowa State Univ., Ames. Dept. of Sociology and Anthropology.
G. L. Bultena, and D. L. Rogers.
Journal of Soil and Water Conservation, Vol. 29, No. 4, p 168-173, July - August 1974. 2 tab, 18 ref. OWRT B-020-IA(7).

Descriptors: *Reservoir construction, *Economic impact, Social aspects, *Iowa, Economics, *Cost analysis, Cost-benefit analysis, Surveys, Attitudes, *Pre-impoundment, *Public opinion, *Ames Reservoir(Iowa), Public interest.

Citizens' opinions toward construction of the Ames Reservoir, proposed by the Army Corps of

Engineers, were examined. Social and economic factors influencing varying opinions toward the project are assessed. The public opinion data suggest a different conclusion about the public interest in this project than would be drawn from the benefit-cost ratio or from political commitments; the perceived personal and collective costs of the reservoir were the most important of the several factors that affected respondents' opinion. (Seip-IPA)
W78-06817

WATER QUALITY STANDARDS AND COMMUNITY VIABILITY,
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-06818

VOLUNTARY ASSOCIATION MEMBERSHIP AND POLITICAL PARTICIPATION: AN EXPLORATION OF THE MOBILIZATION HYPOTHESIS,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 6E.
W78-06819

GUIDELINES FOR DEVELOPING STATE AND NATIONAL PUBLIC LAND USE POLICIES,
Iowa State Univ., Ames. Dept. of Economics.
J. F. Timmons.
Report presented at the conference 'Toward an Effective Land Use Policy for Michigan,' Kellogg Center, Michigan State University, East Lansing, May 17, 1973. 27 p, 12 ref. OWRT B-020-IA (6).

Descriptors: *Land use, *Land management, *Public lands, *Planning, *Land use policy, Policy making.

Guidelines for the development of state and public land use policies are presented. Subjects include: (1) the need for land use policies resulting from current land use and environmenta problems, (2) the nature and scope of land use policy and its objectives, (3) recommended shifts toward state initiatives in developing land use policy, (4) recommended shifts in the control of land resources -- from public interest, and (5) suggested guidelines for developing land use policies as a continuing process. The inter-relationships between land use, environmental quality, and public interest goals are emphasized. Land use policy development procedures and public interest goals are emphasized. Land use policy development procedures should include: (1) a statement and analysis of goals, economic impact, and trade-offs, (2) provisions of flexibility in regulation and compliance contingent upon an area's regional problems or peculiarities, (3) encouragement for experimentation, innovation, and applied research, (4) evaluation of on-going programs, (5) room for citizen participation in planning and implementation, (6) means efficiently and effectively bringing each level of government into land use policy, planning, programming, and performance, (7) financial incentives, (8) consideration of all current and potential uses of natural resources and their environmental effects, and (9) analysis of the impact of technological advances. (See also W73-12697) (Seip-IPA)
W78-06825

BUREAU OF RECLAMATION ECONOMIC ASSESSMENT MODEL (BREAM), TECHNICAL DESCRIPTION.
Mountain West Research, Inc., Tempe, AZ.
For primary bibliographic entry see Field 6A.
W78-06903

ENVIRONMENTAL QUALITY ASSESSMENT IN MULTIOBJECTIVE PLANNING,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 6G.
W78-06905

VOLUNTARY ASSOCIATIONS AND POLITICAL EQUALITY: AN EXTENSION OF MOBILIZATION THEORY,
Iowa State Univ., Ames. Dept. of Sociology and Anthropology.
D. L. Rogers, and G. L. Bultena.
Iowa Agricultural Home Economies Experiment Station, Ames, Journal Paper No J-8127, (Project No 1858), (1975). OWRT B-020-IA(10).

Descriptors: *Political aspects, Iowa, Social participation, Attitudes, Socioeconomic analysis, *Mobilization theory, *Organizational membership, *Political activity, Social classes, Economic classes, Political participation.

Utilizing a data sample of 390 adult persons in three Iowa counties, an assessment was made of the extent to which high- and low-status persons are differentially mobilized to political participation through their voluntary association memberships. The impact of the combined effects of selective class recruitment to organizational memberships and the differential rates of mobilization experienced by social classes on political participation was also examined. The specific goal was to determine whether or not the rate of mobilization differs by class standing, and, if so, whether the rate for low-status persons is sufficiently greater than for high-status persons to offset their proportionately smaller representation in associational memberships. Results indicate that levels of organizational affiliation are related to the political participation rates of both high- and low-status individuals; political activities of high-status persons are increased more by mobilization and associational memberships than those of low-status persons. Class differences in mobilization rates and in organizational memberships concurrently increased political disparities between high- and low-status groups over the circumstances of inoperative mobilization. The analysis suggests that upper class interests will be most well-represented through social organizations. (Seip-IPA)
W78-06924

INVESTOR OWNED VS. PUBLICLY OWNED WATER AGENCIES: AN EVALUATION OF THE PROPERTY RIGHTS THEORY OF THE FIRM,
California Univ., Santa Barbara. Dept. of Economics.
For primary bibliographic entry see Field 6E.
W78-07035

A COMPARISON OF MULTIVARIATE AND TREND FORECASTING ESTIMATES WITH ACTUAL WATER USE,
Waterloo Univ. (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 6D.
W78-07037

MISSOURI RIVER DEVELOPMENT POLICY AND RURAL COMMUNITY DEVELOPMENT,
Nevada Univ., Reno. Renewable Natural Resources Div.
B. Shanks.
Water Resources Bulletin, Vol. 13, No. 2, p 255-263, April 1977. 6 ref.

Descriptors: *Water resources development, *Water policy, *Missouri River, *Community development, *Northern Great Plains, Social costs, Planning evaluation, Federal projects.

Federal planners, in proposing the massive main stem Missouri River water developments in Montana and North Dakota, promised economic and social benefits to the local residents. Five main stem dams--Fort Peck, Garrison, Oahe, Big Bend, and Fort Randall--were evaluated for community and rural development effectiveness. Thirty-seven development factors were examined and improvements noted. Only small differences were noted between areas with water developments and the control area. Further analysis revealed that water development benefits moved downstream and to existing urban areas. The Missouri River's rural areas and small communities were not developed significantly by the water projects. Several problems associated with water development policy were illustrated by the study. Cultural differences between planners and the population impacted were ignored. Second, the allocation of social costs was not considered, and related to this, serious geograhic maldistribution of benefits and costs resulted. The differences between predevelopment promises and development performance were dramatic. While the large dams remain as landmarks to engineering prowess, the projects needs to be evaluated for their success in meeting humanistic development objectives. Major redevelopment may be warranted by such an ex-post evaluation. (Bell-Cornell)
W78-07041

ECONOMIC IMPACT OF MEXICO'S 200-MILE OFFSHORE FISHING ZONE ON THE UNITED STATES GULF OF MEXICO SHRIMP FISHERY,
Texas A and M Univ., College Station. Dept. of Agricultural Economics.
W. L. Griffin, and B. R. Beattie.
Land Economics, Vol. 54, No. 1, p 27-38, February, 1978. 3 fig, 3 tab, 12 ref, append.

Descriptors: *Economic impact, *Mexico, *Fisheries, *Shrimp, Gulf of Mexico, Fishing, Costs, Prices, Yield functions, Equations, Estimating.

Explored is the expected economic impact of Mexico's 200-mile extended jurisdiction limit on the U.S. Shrimp fleet in the Gulf of Mexico. Specifically, the average annual reduction in shrimp landings from Mexican waters by the U.S. fleet is estimated, and an assessment is made of the consequent expected increase in effort that will be exerted off the U.S. coast. Finally, the impact of this shift in effort is explored in terms of rent loss to the fishery and break-even product prices required to achieve open-access equilibrium. Given the present shrimp price and cost-of-production situation, it appears that adjustment to Mexico's 200-mile extended jurisdiction will not result in negative rents for the U.S. Gulf shrimp fleet. (Bell-Cornell)
W78-07043

WATER SUPPLY FEASIBILITY STUDIES IN PHILIPPINES,
Camp, Dresser and McKee, Inc., Boston, MA.
For primary bibliographic entry see Field 5F.
W78-07047

A METHODOLOGY FOR OUTDOOR RECREATION ANALYSIS IN A STATE WATER RESOURCES PLANNING STUDY,
Geological Survey, Menlo Park, CA. Environmental and Safety Section.
S. L. Chiang, and W. A. Gast.
Water Resources Bulletin, Vol 13, No 4, p 677-689, August 1977. 2 fig, 3 tab, 6 ref.

Descriptors: *Recreation, *Methodology, *Water resources, *Planning, Fishing, Boating, Swimming, Picnicking, Camping.

Presented is a methodology for outdoor recreation analysis in a comprehensive State water resources planning study. This methodology applies to determination of recreation participation desires among the population, allocation of those desires to areas of potential resources within which they must be satisfied, comparison of the areal potential resources against the allocated desires to identify areas having recreational resource deficits or

needs, and exploration of alternative solutions to the identified needs. Major elements discussed are: market area, inflow-outflow, resources desire determination and projection, resource desire allocation, facility inventory, resource desire-resource analysis and alternative solutions to identified needs of water-oriented outdoor recreation. In conclusion, this methodology provides for a wide area outdoor recreational analysis, provided that applicable for distributing population-based desires to resource-based supply facilities. (Bell-Cornell)
W78-07049

MAN-MADE LAKES: ATTITUDE SURVEYS OF THEIR VALUE IN RESIDENTIAL AREAS,
Hydrocomp, Inc., Atlanta, GA.
T. N. Debo.
Water Resources Bulletin, Vol 13, No 4, p 665-676, August 1977. 1 tab.

Descriptors: *Lakes, *Surveys, *Land use, *Urban planning, *Urban development, *Attitudes, Parks, Real estate, Recreation facilities, Residential areas, Water quality, Water resources, Economic enhancement.

Attitudinal surveys of residents living near four small residential lakes were conducted to determine how people perceived the advantages and disadvantages associated with the lakes. The survey results indicate that lakes can be used as a tool for land development, creating a variety of benefits and problems. Most people felt that lakes: have a positive economic impact on the value of their home, are a positive factor in their decision to purchase a home, and provide them with some benefits. They were also aware that lakes create continual maintenance and water quality problems, but they were willing to pay for the maintenance if they had access to and could utilize the facilities associated with the lakes. Based on survey results, recommendations are formulated pertaining to the planning development and utilization of residential lakes. Among these are: (1) make the lake as large as possible; (2) develop community part and recreation facilities adjacent to the lake; and (3) establish an ongoing maintenance program to care for the lake and its asociated facilities. (Bell-Cornell)
W78-07050

A CASE HISTORY TO EVALUATE THE PERFORMANCE OF WATER-SPREADING PROJECTS,
Agricultural Research Service, Fresno, CA. Water Management Research.
For primary bibliographic entry see Field 4B.
W78-07105

ENVIRONMENTAL ORIENTATIONS: CONTENT AND SOCIAL CLASS CORRELATES,
Iowa State Univ., Ames. Dept. of Sociology.
S. E. Wright, and G. L. Bultena.
1973. 18 p, 3 tab, 25 ref. OWRT B-020-IA(3).

Descriptors: *Social aspects, *Social values, *Social participation, *Education, *Occupations, *Income, *Iowa, Environment, *Environmental movement participation, *Socioeconomic status, *Social class.

In a study of socioeconomic correlates of environmental movement participation, 390 persons from 3 counties in Iowa were interviewed. Environmental orientations were measured, using 9 items with a Likert-type response format. The items were constructed to reflect: (1) commitment to preservationist versus development goals in natural resource management; and (2) commitment to governmental actions versus individual solutions in dealing with environmental issues. Consistent with previous research, significant correlations were obtained for occupation, socioeconomic index, and education, with education being the most salient. As hypothesized, significant correlations were found among these measures and Government Involvement Scales and Growthist-Preservationist Scales; however, the relationship between these scales and family income was rejected. Regression analysis revealed that a total of less than 9% of the variance in the Growthist-Preservationist Scale was accounted for by social class variables, with 8.34% of that 9% explained by education alone. The social class variables explained only 5.6% of the total variance in Government Involvement responses, with 4.7% accounted for by education. Thus over 90% of the variance in scores obtained on the two scales could not be accounted for by social class dimension. The conclusion: class differences in environmental orientations have been overemphasized. (Seip-IPA)
W78-07125

CHARACTERISTICS AND CORRELATES OF PUBLIC KNOWLEDGE ABOUT A WATER RESOURCE DEVELOPMENT ISSUE,
Iowa State Univ., Ames. Dept. of Sociology and Anthropology.
G. L. Bultena, D. L. Rogers, and K. A. Conner.
(1975). 28 p, 4 tab, 27 ref. OWRT B-020-IA(9).

Descriptors: *Social participation, *Social values, *Social aspects, Water resources, *Reservoirs, *Iowa, *Public knowledge, *Public participation.

Public knowledge about an environmental (reservoir) project proposed by the Army Corps of Engineers was examined. Study objectives were: (1) to determine how knowledgeable local citizens were about the proposed reservoir, for the purpose of assessing their ability to meaningfully respond to the Corp's proposal, and (2) to test the importance of several variables which were hypothesized as affecting the knowledge levels of individual respondents. The variables which were hypothesized as affecting knowledge of environmental issues included: social class, age, personal attitudes, perceptions of likely impacts of a reservoir, and amount of social interaction and group involvement of persons regarding community issues. Although the project proposal had become a prominent local issue, a relatively low level of public knowledge about the reservoir existed. As hypothesized, the best informed persons were those who were (1) younger in age, (2) of higher socio-economic status, (3) more strongly opinionated on environmental issues, (4) more convinced of the efficiacy of citizen actions in public affairs, (5) more conscious of likely community impacts of a reservoir, and (6) most often convinced they were benefactors, rather than beneficiaries, of the project. The strongest explanatory variable for such knowledge was extensive previous political involvement in activities designed to influence agency decision making. Respondents who were receiving greatest personal benefits from a reservoir were no better informed about the project than those who were anticipating few, if any, benefits. Relatively few respondents perceived themselves deriving personal benefits from the reservoir. (Seip-IPA)
W78-07126

ESTIMATING THE ECONOMIC VALUE OF NATURAL COASTAL WETLANDS: A CAUTIONARY NOTE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6C.
W78-07146

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

COSTS OF WASTEWATER TREATMENT BY LAND APPLICATION, MCD-10,
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.
For primary bibliographic entry see Field 5D.
W78-06760

HOUSEHOLD WATER CONSERVATION AND WASTEWATER FLOW REDUCTION,
Energy Resources Co., Inc., Cambridge, MA.
For primary bibliographic entry see Field 3D.
W78-06782

ESTIMATING THE ECONOMIC VALUE OF NATURAL COASTAL WETLANDS: A CAUTIONARY NOTE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
L. A. Shabman, and S. S. Batie.
Sea Grant Research Report A.E. 30, August, 1977. 21 p, 29 ref.

Descriptors: *Wetlands, *Economics, *Land resources, *Property values, Coastal marshes, Marsh management, Decision making, Economic justification, Monetary benefits, Natural resources, Productivity, Value, Water values, Conservation.

This is a critique of the methodology used by Gosselink, Odum, and Pope (GOP) in 'The Value of the Tidal Marsh,' the most cited study which evaluates the economic values of wetlands. It identifies the major conceptual errors in methodology and demonstrates that there is reason to be skeptical of the value estimates. There are two fundamental problems with the GOP approach. GOP failed to recognize the nature of the process by which economic values are determined and incorrectly combined the principles of systems ecology with economic theory. This failure makes the values calculated for 'total life-support' meaningless for conceptually correct economic comparisons for development and preservation. Second, where GOP attempted to apply proper economic principles, they made numerous errors which resulted in estimates of economic values that are in error. GOP's estimates of the values of marsh services are inaccurate and misleading. (Steiner-Mass)
W78-07146

6D. Water Demand

ESTIMATING LIVESTOCK WATER USE RATES IN RURAL WATER SYSTEMS,
Burns and McDonnell, Kansas City, MO.
For primary bibliographic entry see Field 3F.
W78-06820

DEVELOPING COMPETITION FOR WATER IN THE URBANIZING AREAS OF COLORADO,
Colorado State Univ., Fort Collins. Dept. of Economics.
R. L. Anderson, and N. I. Wengert.
Water Resources Bulletin, Vol 13, No 4, p 769-773, August 1977. 2 tab, 1 ref.

Descriptors: *Irrigation, *Municipal water, *Agricultural production, *Water resources development, Water supply, Water rights, Costs, Competition, Denver(Colo), Condemnation, Land use change.

Rapid population growth in the metropolitan area of Denver, Colorado is causing conflicts over water use. Two cities, Thornton and Westminster, have begun condemnation proceedings against three irrigation companies to secure agricultural water rights for municipal use. This is the first condemnation proceeding against irrigation water rights for municipal use. Should the suit succeed, over 30,000 acres of presently irrigated land will lose its water supply. There are about four hundred landowners in the area; two hundred of these are commercial farmers, including truck, dairy and specialty farms. Total agricultural production

amounts to about $8 million per year. About 561 jobs related to agricultural production amounts to about $4 million in net income. Only 6.4 percent of the farmland along the Front Range is irrigated. Continued urban growth will put pressure on the water supply of much of this land. The interested parties of the region should cooperate to lessen the impact of urban growth on agricultural lands and water by forming a metropolitan water district. Such a district could share costs of development of additional municipal water and develop systems where municipalities would recycle waste water back to the irrigated lands. (Bell-Cornell)
W78-07034

A COMPARISON OF MULTIVARIATE AND TREND FORECASTING ESTIMATES WITH ACTUAL WATER USE,
Waterloo Univ. (Ontario). Dept. of Geography.
B. Mitchell, and P. H. Leighton.
Water Resources Bulletin, Vol. 13, No. 4, p 817-824, August 1977. 2 tab, 1 fig, 9 ref.

Descriptors: *Water demand, *Forecasting, *Multivariate procedure, *Barrie(Ontario), Municipal water, Estimating, Trend forecasting, Metered consumption, Subdivisions, Water utilization.

Described is a multivariate water forecasting procedure that is neither complicated, time-consuming, nor expensive to operationalize. The procedure has been used to estimate the water demand for a proposed subdivision in Barrie, Ontario. Reliability is checked by applying the method to two existing subdivisions in Barrie for which metered consumption is available. For comparison, a trend forecasting procedure is also applied to the proposed subdivision and the existing subdivisions. Both the multivariate and trend forecasting techniques provide encouragingly accurate results when compared to actual use. While the multivariate procedure allows more precision, both procedures should be useful in forecasting water demand for smaller municipalities. (Bell-Cornell)
W78-07037

TO MINE OR NOT TO MINE GROUNDWATER,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W78-07102

6E. Water Law and Institutions

NEW REQUIREMENTS FOR LOCAL UNITS OF GOVERNMENT IN WATER RESOURCES PLANNING: INSIGHTS FOR IMPLEMENTATION FROM RECENT WATER RESOURCES PLANNING RESEARCH,
Say (E. W.) and Associates, Inc., Chelsea, MI.
E. W. Say, and A. J. Dines.
Water Resources Bulletin, Vol. 13, No. 5, p 907-915, October 1977. 1 fig, 2 tab, 7 ref. OWRT C-5278(4219)(2).

Descriptors: *Water resources, *Planning, *Water management(Applied), *Governments, *Legislation, *Watersheds(Basins), Projects, Environment, Protection, *Local units of government, Citizen involvement techniques, Preventive measures, Applied research.

Recent Federal and some State legislation have enlarged the scope of permitted or required actions of local units of government in water resources management and protection. Much of the legislation encourages local units of government to introduce water resources planning measures which will be preventive instead of corrective. Extensive public works measures, environmental destruction and the threat to human life can thus be eliminated or reduced. Research has developed and tested a method for identifying the elements of a water resouces protection program for small urbanizing watersheds which was technically adequate and socially acceptable to the communities implementing such programs. Research results suggest that deliberate efforts will be necessary to inform and educate local units of government as to the usefulness of the legislation, and that the program must reflect local natural resource conditions and local preferences for the method of accomplishing the protection. Successful implementation could be restrained by inertia of local units of government, a lack of tradition in such programs, and hostile existing agencies. (Bell-Cornell)
W78-06742

FIFTH ANNUAL REPORT: GREAT LAKES WATER QUALITY.
International Joint Commission-United States and Canada.
For primary bibliographic entry see Field 5G.
W78-06762

MISSOURI RIVER BASIN. STATE AND FEDERAL WATER AND RELATED LAND RESOURCE PROGRAMS, FISCAL YEARS 1978-1982.
Missouri River Basin Commission, Omaha, NE.
December 1977, 11 volumes, including Federal Agency Programs, Colorado, Iowa, Kansas, Minnesota, Missouri, Montana, Nebraska, North Dakota, South Dakota, Wyoming.

Descriptors: *Missouri River, *Water resources, *Land resources, *Planning, *Programs, Iowa, Kansas, Minnesota, Missouri, Montana, Nebraska, North Dakota, South Dakota, Wyoming, Construction, State government, Federal government, Local governments, Colorado, *Funding, Federal agency programs.

The report is organized in 11 volumes. Volume I contains Federal agency program descriptions followed by a summary of water and related land resource programs within the Missouri River Basin. A series of tables presents the water and related land resources planning activities and funding of the Commission and other special purpose organizations. Finally, summaries of Federal, state and local planning and construction fundings for the basin are included. Volumes II-XI are organized by each state. Presented are: (1) a summary of the funding for state and local planning and construction, followed by specific state and local program activities and their funding; (2) a summary of the funding for Federal agency ongoing planning and construction programs, followed by specific Federal agency ongoing programs and their funding; and (3) a summary of the funding for Federal agency new start or resumption programs, followed by the specific Federal agency new start or resumption programs and their funding. (Zayac-NC)
W78-06771

POLITICS OF SHORE EROSION: WESTHAMPTON BEACH,
State Univ. of New York at Albany. Graduate School of Public Affairs.
J. M. Heikoff.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 213, Price codes: A09 in paper copy, A01 in microfiche. Prepared for National Oceanographic and Atmospheric Administration, Office of Sea Grant, 173 p. Published by Ann Arbor Science Publisher, Inc., Ann Arbor, Michigan, 1976.

Descriptors: *Institutional constraints, *Coasts, *Erosion control, *Management, *Land use, Erosion, Planning, State governments, Local governments, Economic impact, Political constraints, Barrier islands, Geomorphology, New York, Resources, Army Corps of Engineers, Public participation, *Westhampton Beach(NY), Political decision-making.

This study is concerned with the problem of structuring governmental institutions and decision-making for coastal zone management. This problem is analyzed through the detailed example of a specific environmental problem--beach erosion and hurricane protection at Westhampton Beach, Long Island. The economic and political factors surrounding the problem and its causes are examined. The study's method involves: introducing the problems of resource management in the coastal zone; describing barrier islands, their formation and how they affect coastal geomorphologic processes; explaining the solution of the U.S. Army Corps of Engineers to shore erosion; analyzing federal, state and local structures for interaction and decision-making in managing coastal resources; and outlining the role of the individual citizen and of groups influencing public decisions. The study had two objectives. One was to find out how scientists and engineers defined the shore erosion problem and what they recommended as a course of action to deal with it. The other was to see how this information was used by the political decision-makers and governmental administrators at the federal, state, and local levels in determining policy and a program of action. The study's conclusions focus on the difficulties and implications for state and local governments trying to analyze and solve coastal resource management problems. (Nessa-NC)
W78-06776

METHODOLOGY TO EVALUATE ALTERNATIVE COASTAL ZONE MANAGEMENT POLICIES: APPLICATION IN THE TEXAS COASTAL ZONE, SPECIAL REPORT IV: INSTITUTIONAL IMPACT OF ALTERNATIVE COASTAL ZONE MANAGEMENT SYSTEMS,
Lyndon B. Johnson School of Public Affairs, Austin, TX.
For primary bibliographic entry see Field 6B.
W78-06777

TRIANGLE J 208 AREAWIDE WATER QUALITY MANAGEMENT PLAN.
Triangle J Council of Governments, Research Triangle Park, NC.
For primary bibliographic entry see Field 5G.
W78-06788

SOUTHEASTERN NEW ENGLAND STUDY OF WATER AND RELATED LAND RESOURCES-URBAN WATER AND RELATED LAND RESOURCES-URBAN WATERS SPECIAL STUDY.
Skidmore, Owings and Merrill, Boston, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 818, Price codes: A09 in paper copy, A01 in microfiche. New England River Basins Commission, Boston, MA, Prepared for Economics Research Associates, January 1975, 179 p, 12 fig, 4 append.

Descriptors: *Land use, *Management, *Planning, Water resources, *New England, Administration, Financing, Institutions, Investment, Economics, Legal aspects, *Urban waterfronts, *Coastal resources, *Coastal development, Coastal management, Coastal policies.

The report incorporates the findings of the Urban Waters Study project for the Southeastern New England (SENE) region. The study aims at the particular issues and problems facing the cities and towns with waterfronts on rivers or coastal waters. At writing, the principal urban waterfront management problems revolved around institutional, administrative and funding issues. These include the need to create public awareness; development of priority land uses; the need for institutional mechanisms to balance governmental concerns and resolve land use conflicts; improving local, regional and state capabilities in land use decision-making; and the need for public and private investment in urban waterfront areas. The report

analyzes the physical, economic, ecological, and legal and institutional issues relating to urban waterfronts of the region. Specific planning and design guidelines are recommended, as well as institutional and legal mechanisms for implementing waterfront control and guiding improvements. (Zayac-NC)
W78-06792

PUBLIC PARTICIPATION IN WATER RESOURCES PLANNING: A CASE STUDY AND LITERATURE REVIEW,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W78-06809

PACIFIC SOUTHWEST INTER-AGENCY COMMITTEE MINUTES OF THE 77-3 MEETING, 13-14 DECEMBER 1977, LAS VEGAS, NEVADA.
Pacific Southwest Inter-Agency Committee, San Francisco, CA.
1978. 161 p, 7 fig, 3 tab, 5 ref.

Descriptors: *Southwest U.S., Water resources, Assessments, Estimating, Water treatment, Research and development, Technology, Colorado River, Great Basin, *Pacific Southwest Inter-Agency Committee, Las Vegas(NV), Meetings, Water institutes.

Included are a report of Water Resources Council activities, executive subcommittee report, progress report on the 1975 national water assessment project, report from the Consortium of Water Institutes and Centers, technical subcommitte reports, approval of amendments to articles of organization and procedures, semiannual reports, future meetings and plans, and consideration of the future role of the PSIAC in water resources assessment, planning, and management. The Water Resources Council activities reported concern principles and standards, cost sharing, Indian water rights, institutions, conservation, water quality, water research, and Federal reserve water rights. Completion of the national assessment of water resources for the upper Colorado region was announced, with progress reports given on the lower Colorado, Great Basin, and California regions. (Wares-IPA)
W78-06815

VOLUNTARY ASSOCIATION MEMBERSHIP AND POLITICAL PARTICIPATION: AN EXPLORATION OF THE MOBILIZATION HYPOTHESIS,
Iowa State Univ., Ames.
D. L. Rogers, G. L. Bultena, and K. H. Barb.
The Sociological Quarterly, Vol. 16, p. 305-318, Summer 1975. 3 tab, 30 ref. OWRT B-020-IA (8).

Descriptors: *Political aspects, *Social aspects, Surveys, *Political participation, *Mobilization theory, Selection theory, *Organizational involvement, Political activity, Political involvement, Socioeconomic status.

Survey data from 390 respondents were analyzed to determine the relative effects of organizational involvement, socioeconomic status, and political attitudes on political participation. Two theoretical perspectives were investigated: mobilization theory and selection theory. Both the mobilization and selection perspectives were supported by the data; however, organizational involvement explained more of the variance in political participation than did social status and political attitudes. The mobilization perspective was further examined to determine if it worked equally well in all types of organizations. The relationship between organizational involvement and political participation was stronger for 'instrumental' than for 'expressive' groups and for organizations characterized by high, as compared to low, levels of political discussion. (Seip-IPA)
W78-06819

THE ADAPTATION OF GROUNDWATER-CONTROL INSTITUTIONS TO THE ARID WEST,
Montana State Univ., Bozeman. Dept. of History.
R. G. Dunbar.
Agricultural History, Vol. 51, No. 4, p. 662-680, October, 1977. 125 ref. OWRT A-059-MONT(3).

Descriptors: *Water management(Applied), *Groundwater, *Prior appropriation, Rocky Mountain Region, Riparian rights, Arid lands, *Appropriation doctrine, *Riparian doctrine, *Western states.

The history of the transformations of institutions governing the use of groundwater in the arid western states is detailed. The transitions from riparian doctrine to English rule of absolute ownership to the appropriation doctrine (now adopted in most western states) are documented. Today, all the Rocky Mountain States (with the exception of Arizona) have adopted a complex of institutions which embody the application of the appropriation doctrine to groundwater, registration of vested rights, acquisition of new rights through the issuance of permits by an administrative officer and the designation of controlled or critical areas. The modification of groundwater doctrines by various western states is outlined. (Seip-IPA)
W78-06822

GUIDELINES FOR DEVELOPING STATE AND NATIONAL PUBLIC LAND USE POLICIES,
Iowa State Univ., Ames, Dept. of Economics.
For primary bibliographic entry see Field 6B.
W78-06825

PROCEEDINGS OF THE INTERNATIONAL SYMPOSIUM ON MARINE POLLUTION RESEARCH.
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 5G.
W78-06906

AN OVERVIEW OF THE USEPA PROGRAM IN MARINE POLLUTION RESEARCH,
Environmental Protection Agency, Washington, DC. Office of Research and Development.
For primary bibliographic entry see Field 5G.
W78-06907

RESPONSIBILITIES FOR MARINE POLLUTION RESEARCH WITHIN FEDERAL AGENCIES OF THE UNITED STATES,
Environmental Research Lab., Gulf Breeze, FL.
For primary bibliographic entry see Field 5G.
W78-06908

OVERVIEW OF MARINE POLLUTION RESEARCH IN THE BALTIC,
Institute of Meteorology and Water Management, Gdynia (Poland). Sea Dept.
For primary bibliographic entry see Field 5G.
W78-06909

MARINE POLLUTION RESEARCH IN YUGOSLAVIA: AN OVERVIEW,
Institut Rudjer Boskovic, Zagreb (Yugoslavia). Center for Marine Research.
For primary bibliographic entry see Field 5G.
W78-06910

OVERVIEW OF MARINE POLLUTION RESEARCH IN EGYPT,
Alexandria Inst. of Oceanography and Fisheries (Egypt).
For primary bibliographic entry see Field 5G.
W78-06911

OVERVIEW ON POLLUTION IN THE COASTAL ENVIRONMENT OF PAKISTAN AND ITS POSSIBLE IMPLICATION FOR THE MARINE ECOSYSTEM,
Karachi Univ. (Pakistan). Inst. of Marine Biology.
For primary bibliographic entry see Field 5G.
W78-06912

OVERVIEWS ON MARINE POLLUTION IN INDIA,
University of West Florida, Pensacola. Dept. of Biology.
For primary bibliographic entry see Field 5G.
W78-06913

VOLUNTARY ASSOCIATIONS AND POLITICAL EQUALITY: AN EXTENSION OF MOBILIZATION THEORY,
Iowa State Univ., Ames. Dept. of Sociology and Anthropology.
For primary bibliographic entry see Field 6B.
W78-06924

REVIEW OF AUSTRALIA'S WATER RESOURCES 1975,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-06947

OVERVIEW OF FEDERAL GROUNDWATER PROTECTION LEGISLATION AIDS ENVIRONMENTALISTS,
Office of Radiation Programs, Washington, DC. Div. of Criteria and Standards.
For primary bibliographic entry see Field 5G.
W78-06956

DEPLETION ALLOWANCE FOR GROUNDWATER MINING: PROS AND CONS,
Texas Dept. of Water Resources, Austin.
For primary bibliographic entry see Field 4B.
W78-06957

DEVELOPING COMPETITION FOR WATER IN THE URBANIZING AREAS OF COLORADO,
Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 6D.
W78-07034

INVESTOR OWNED VS. PUBLICLY OWNED WATER AGENCIES: AN EVALUATION OF THE PROPERTY RIGHTS THEORY OF THE FIRM,
California Univ., Santa Barbara. Dept. of Economics.
W. D. Morgan.
Water Resources Bulletin, Vol. 13, No. 4, p 775-81, August 1977. 2 tab, 8 ref.

Descriptors: *Water costs, *Theory of firm, *Property rights, Water agencies, Evaluation, Multiple regression analysis, Data collections, Equations, Cost functions, Cost structure.

The property rights theory of the firm, based on utility maximization, provides a general framework upon which to predict firm behavior under differing institutional constraints. Herein, the property rights theory of the firm is evaluated by comparing the cost structures of a sample of water agencies under two alternative modes of ownership: public and investor owned agencies. A sample of 143 water supplying firms has been chosen from the states in the American Water Works Association survey that listed four or more investor owned companies. The states are California, Connecticut, Illinois, New Jersey, and Pennsylvania. While all firms in the sample supply water to various classes of users employing similar

technology, the specific source, treatment, or distribution conditions can differ for each firm. A multiple regression model describing the determinants of total operating costs is used to isolate the effects of the form of ownership. Results indicate that investor owned water agencies appear to have lower cost structures. (Bell-Cornell)
W78-07035

EXPERIENCE WITH THE 303-208-201 STUDY RELATIONSHIPS,
Clinton Bogert Associates, Fort Lee, NJ.
For primary bibliographic entry see Field 5G.
W78-07038

WATER SUPPLY FEASIBILITY STUDIES IN PHILIPPINES,
Camp, Dresser and McKee, Inc., Boston, MA.
For primary bibliographic entry see Field 5F.
W78-07047

WATER RIGHTS, EMINENT DOMAIN, AND THE PUBLIC TRUST,
Colorado State Univ., Fort Collins. Dept. of Economics.
G. E. Radosevich, and M. B. Sabey.
Water Resources Bulletin, Vol 13, No 4, p 747-757, August 1977. 12 ref.

Descriptors: *Water rights, *Eminent domain, *Public trust doctrine, Municipal water condemnation, Legislation, Agriculture, Water allocation(Policy), Irrigation companies.

Faced with the necessity of meeting growing muncipal water requirements in areas where available supplies are completely allocated, numerous cities throughout the West are turning to their eminent domain powers to affect a reallocation of water from less preferred uses to municipal uses, thus bringing about a sharp conflict with agricultural interests. As a basis for discussing these eminent domain powers, this paper begins with a brief review of the development of property rights. The existence of both private and public (social) rights in the 'bundle of rights' is noted. In recent years, the Public Trust Doctrine has been used to limit private rights in property, and to protect and strengthen social rights. A case study which focuses on a conflict between individual and social interests in water rights is discussed. The case involves the City of Thorton, Colorado which initiated municipal condemnation proceedings to acquire the water rights and structures of two nearby irrigation companies. The case represents an attempt to incorporate the spirit of the Public Trust Doctrine into legislation which sets forth procedures for resolution of similar water rights conflicts that will inevitably become more numerous throughout the West in the future. (Bell-Cornell)
W78-07051

EXISTING LEGAL FRAMEWORK FOR MANAGEMENT OF VIRGINIA'S COASTAL WETLANDS,
Virginia Polytechnic Inst. and State Univ. Blacksburg. Dept. of Civil Engineering.
W. E. Cox.
Sea Grant Research Report A.E. 31, September, 1977. 25 p.

Descriptors: *Wetlands, *Virginia, *Legal aspects, *Marsh management, *Water policy, Coastal marshes, Marshes, Swamps, Legislation, Water law, Regulation, Administrative decisions, Water resources development, *Coastal wetlands, Virginia Wetlands Act.

Virgnina's coastal wetlands presently are subject to a complex legal framework that controls utilization and establishes the basis for substantial public involvement in managerial decision making. This legal framework can be viewed as consisting of three fundamental components. The most direct of these is governmental regulation of private wetlands alteration. A second closely related component consists of the various environmental and other mandatory review procedures that constrain decision making by the agencies directly involved in regulation. The third component of the legal framework consists of several provisions of law that serve as potential mechanisms for preservation of wetlands through public acquisition or control as sanctuaries. All three components are reviewed in this report and discussed in the applicability of the preservation and management of Virginian wetlands. (Steiner-Mass)
W78-07075

ECONOMIC IMPLICATIONS OF ENVIRONMENTAL LEGISLATION FOR WETLANDS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
S. S. Batie, and W. E. Cox.
Sea Grant Research Report A.E. 29, October, 1976. 16 p.

Descriptors: *Wetlands, *Legal aspects, *Marsh management, *Economics, Virginia, Legislation, Permits, Planning, Water law, Building codes, Cost-benefit analysis, Rivers and Harbors Act, Army Corps of Engineers, Wetland legislation.

Three types of environmental legislation are reviewed: (1) the U.S. Army Corps of Engineers controls over work in navigable waters, (2) the Virginia and Maryland Wetlands Programs, and (3) various legislation for creating sanctuaries. The intent of each of these pieces of legislation is to reduce the number of wetlands conversions over what might have been without legislation. The economic implications of such legislations are difficult to quantify. Some development services of altered wetlands. Preservation benefits attributable to wetlands include production of fish, wildlife and flora, protection against shore erosion, absorption of silt and pollutants that enhance the recreational and aesthetic enjoyment. The social costs of obtaining these benefits for the public domain are those of the costs of devising, implementing, and policing the land use controls; the loss the society of the development foregoes; and the loss associated with reduction of individual choice concerning land use decisions. The balancing of the benefits gained versus the benefits lost is the key issue in managing wetlands. (Steiner-Mass)
W78-07080

RIPARIAN RIGHTS WITHIN INDIAN RESERVATIONS, CONFEDERATED SALISH AND KOOTENAI TRIBES V. NAMEN; UNITED STATES V. FINCH.
Montana Law Review, Vol. 38, No. 2, p 424-26, Summer 1977.

Descriptors: *Reservation doctrine, *Montana, *Navigable waters, *Indian reservations, *Riparian rights, Trespass, Riparian land, Treaties, River beds, Judicial decisions, Land tenure, Public access, Recreation, Water law, Legal aspects, Banks, Beds, Navigable rivers, Fishing, Stream beds, Public lands.

Two recent federal court decisions clarify the rights of persons who own land adjacent to navigable waters on the Flathead and Crow Indian Reservations. Confederated Salish and Kootenai Tribes v. Namen and United States v. Finch together establish that the owners of waterfront property on these reservations possess the common law rights of access and wharfage to the navigable water but do not have an unregulated right to recreational fishing. Defendant landowners in Namen were successors-in-interest to an Indian who had received the land under the Indian Allotment Act of 1904. The court applied federal common law and held that contrary to the Indians' contentions, the non-Indian waterfront landowners were entitled to rights of access and wharfage. In Finch, authority asserted by the Crow tribe to control fishing within their reservation was upheld by the court under a federal statute. The court conceded that the defendant had a right to fish from the bank where he was arrested but held that the right was subject to the exclusive regulation of the Crow tribe due to their ownership of the riverbed under past treaties. (Hammersley-Florida)
W78-07198

IMPLEMENTATION OF THE TRANSFER PROCESS UNDER THE APPROPRIATION DOCTRINE,
L. M. Hartman, and D. Seastone.
In: Water Transfer: Economic Efficiency and Alternative Institutions, p. 15-62, Johns Hopkins Press, Baltimore, 1970. 2 fig, 17 tab.

Descriptors: *Water transfer, *Water policy, *Water supply development, *Institutions, *Water distribution(Applied), Inter-basin transfers, Water law, Coordination, Economic efficiency, State governments, Judicial decisions, Transfer, Water rights, Beneficial use, Administrative agencies, Water supply, Water districts, Legal aspects, Water importing, Appropriation, Water conservation, Water management(Applied), Administrative decisions.

Changing demands for water use require states to discover the best institutional procedures for the legal implementation of water transfers. Because professional engineers in administrative agencies are better qualified for decision-making on water transfers, the author argues that this procedure is better than the alternative of a state court determination. He feels that judges are unable to understand fully the technical difficulties involved since they only receive information in an adversary setting. Although institutional restraints may hamper water transfer, a study of a mutual ditch company revealed no obvious institutional restraint on the operation of competitive market forces for allocating water resources within a company. A final organizational form studied was the water conservancy district. The district, a public agency, developed water projects and allocated water to individuals and corporations which contracted with the district. After studying a Colorado water district where the project supplied twenty-five percent of the water used in the district, the author concludes that reallocation can be secured on a large-scale institutional basis. (See also W78-036011) (Cocheu-Florida)
W78-07199

6F. Nonstructural Alternatives

FLOOD HAZARD IN THE UNITED STATES: A RESEARCH ASSESSMENT,
Colorado Univ., Boulder. Inst. of Behavioral Science.
G. F. White.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 023, Price codes: A08 in paper copy, A01 in microfiche. Prepared for Research Applied to National Needs (RANN), National Science Foundation, 1975. Part of a series of volumes assessing the research on natural hazards. 143 p, 11 tab, 20 fig, 1 append. GI-32942.

Descriptors: *Floods, *Flood forecasting, *Research priorities, *Non-structural alternatives, *Land development, *Land management, Hazards, Flood control, Warning systems, Flood plains, Weather forecasting, Flood warning, Management, Colorado, South Dakota, *Natural hazards, Flood proofing, Rapid City(SD), Boulder(CO).

The Natural Hazards series seeks to develop a basis for judging the social utility of allocating

funds and personnel to the study of natural hazards; and to develop a better appraisal method of research needs. The social and physical impacts of each hazard are discussed in the series. This volume studies flood hazards and addresses floods and their distribution, changes on the nation's flood plains, how the nation is affected, how national forces are shaping adjustments to floods; and reviews the 1972 Rapid City, SD, flood experience. Potential effects of changes in the mix of adjustments to the flood hazard suggest that new research could reveal changes in the uses of flood plains that would reduce costs resulting from improper, unwise use. Five major new lines of research into flood hazards are recommended: (1) improving control and protection; (2) warnings and flood-proofing; (3) land management; (4) insurance, relief and rehabilitation; and (5) basic data and methods, with a discussion of budgets and institutions for each of the suggested lines of research. A future disaster for Boulder, Colorado is presented. (Zayac-NC)
W78-06786

FLOOD PLAIN INFORMATION: OHIO RIVER, CABEL COUNTY/WAYNE COUNTY, WEST VIRGINIA.
Army Engineer District, Huntington, WV.
For primary bibliographic entry see Field 4A.
W78-06795

FLOOD PLAIN INFORMATION: LITTLE PAPILLION CREEK AND SOUTH BRANCH, VOLUME II, OMAHA METROPOLITAN REGION, NEBRASKA.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-06796

FLOOD PLAIN INFORMATION: PAPILLION, BIG PAPILLION AND WEST PAPILLION CREEKS, VOLUME I, OMAHA METROPOLITAN REGION, NEBRASKA.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-06797

FLOOD PLAIN INFORMATION: THOMAS CREEK, COLE CREEK, HELL CREEK, WEST BRANCH PAPILLION CREEK EXTENSION, BIG PAPILLION CREEK EXTENSION, VOL. III, OMAHA METROPOLITAN REGION, NEBRASKA.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-06798

FLOOD PLAIN INFORMATION: ASHLAND, NEBRASKA, SALT CREEK, WAHOO CREEK.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-06799

FLOOD PLAIN INFORMATION: PLATTE RIVER, WARM SLOUGH, TROUBLE CREEK, CENTRAL CITY, NEBRASKA.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-06800

. OD PLAIN INFORMATION: GREAT FALLS, MONTANA, VOLUME I - SUN RIVER.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-06801

SPECIAL FLOOD HAZARD INFORMATION REPORT: GALLATIN RIVER, GALLATIN COUNTY, MONTANA.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-06802

FLOOD PLAIN INFORMATION: BIG THOMPSON RIVER, LOVELAND TO THE LARIMER-WELD COUNTY LINE, COLORADO, LITTLE THOMPSON RIVER, BOULDER AND LARIMER COUNTIES NEAR BERTHOUD, COLORADO.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-06803

6G. Ecologic Impact Of Water Development

THE ENVIRONMENT OF AMCHITKA ISLAND, ALASKA.
Department of Energy, Washington, DC. Div. of Military Application.
Available from the National Technical Information Service, Springfield, VA 22161 as TID-26712, Price codes: A00 in paper copy, A01 in microfiche. ERDA Report, 1977. 682 p, 288 fig, 140 tab, 1211 ref, 2 append. Edited by M.L. Merritt and R.G. Fuller.

Descriptors: *Nuclear explosions, *Nuclear wastes, *Testing, *Environmental effects, *Ecology, *Alaska, Aquatic animals, Bibliographies, *Amchitka Island(AL), Aleutian Islands(AL), Nuclear weapons test program.

Results of studies on the environmental, biotic, and ecological impacts of a 1967 Atomic Energy Commission nuclear weapons test program, conducted on Amchitka Island in the Aleutian archipelago of Alaska, are compiled. The Amchitka Bioenvironmental Program was conducted from 1967 to 1973 under the auspices of the Commission. Report topics include: geographic setting, geologic history, hydrology, weather and climate, prehistoric human occupation of the Rat Islands, history (1741-1967), previous scientific investigations, geomorphology, soils, terrestrial plant ecology, avifaunal investigations, status of the Norway Rat, limnology, aquatic ecology, fishery resources of the Western Aleutians, oceanography, ecology of marine algae, marine invertebrates in rocky intertidal communities, marine fish communities, resources and population of sea mammals, population estimates and feeding behavior of sea otters, ecological interactions involving the sea otter, sea otter metabolism and heat economy, radionuclides in air, water, and biota, polychlorinated biphenyls in the ecosystems, and ecological consequences of nuclear testing. (Seip-IPA)
W78-06702

OPERATION OF THE NATIONAL WILDLIFE REFUGE SYSTEM (FINAL ENVIRONMENTAL STATEMENT).
Fish and Wildlife Service, Washington, DC.
November, 1976. 697 p, 31 fig, 58 tab, 28 append.

Descriptors: *National Wildlife Refuges, *Environmental effects, *Cost analysis, Social aspects, Recreation, Programs, Project planning, Planning.

Continued operation of the National Wildlife Refuge System is examined from approximately the FY 1974 level of activity projected to 1985. Annual funding requirements are estimated at $22 million, with 883 permanent personnel. Increased costs resulting from inflation and establishment of new refuge areas are anticipated. A description of the Program activity includes a statement of purpose and action, the Refuge mission objectives, current program output and cost assessment, action to implement the program (wildlife population, land, and people management, refuge functions, and land acquisition and disposition). Fish and Wildlife Service Program management, budgeting and funding, and interrelationships with other projects. Environment is discussed in terms of historical perspective; physical and biological resources; classification of refuge types; cultural, social, and economic environment; and probable future environments (without the National Wildlife Refuge System). Environmental impacts and mitigative measures are assessed for: (1) biological and physical environment; (2) wildlife and nonwildlife recreation; (3) visitor safety; and (4) cultural and economic conditions. The impact on topography and natural features and the relationship between short-term uses and long-term productivity are assessed. Alternatives to the current Program are analyzed and cost-assessed. Appendices address such topics as revenue sharing, program planning, system policies, research, and current and projected program activity. (Seip-IPA)
W78-06703

WEST ANTARCTIC ICE SHEET AND CO2 GREENHOUSE EFFECT: A THREAT OF DISASTER,
Ohio State Univ. Research Foundation, Columbus. Inst. of Polar Studies.
For primary bibliographic entry see Field 5B.
W78-06721

A GUIDE TO ENVIRONMENTAL BENEFITS ASSESSMENT IN ECONOMIC IMPACT STUDIES.
Governors State Univ., Park Forest South, IL. Environmental Management Program.
For primary bibliographic entry see Field 6B.
W78-06755

ENVIRONMENTAL ASPECTS OF WATER SPREADING FOR GROUND WATER RECHARGE,
Agricultural Research Service, Fresno, CA. Water Management Research.
For primary bibliographic entry see Field 4B.
W78-06764

A METHODOLOGY FOR PREPARING ENVIRONMENTAL ASSESSMENTS,
Little (Arthur D.), Inc., Cambridge, MA.
D. I. Hellstrom.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-040 113, Price codes: A03 in paper copy, A01 in microfiche. Prepared for Air Force Civil Engineering Center, FL, Report AFCEC-TR-76-9, November 1976. 34 p, 1 fig, 2 tab. JON: 21033E25. F29601-74-D-0027.

Descriptors: *Environmental effects, *Methodology, *Evaluation, *Assessments, Planning, Management, Land use, Legislation, *Environmental impacts, *Environmental assessment, National Environmental Policy Act of 1969, Air Force.

This technical report is prepared as a guide for the preparation of environmental assessments. To be used by Air Force field personnel, the report presents methodologies to be used in assaying important environmental impacts resulting from operations, construction and other actions. Reviewed are the environmental assessment process and relevant federal environmental laws and regulations. The report then discusses the nexus between environmental considerations and planning; presents an inventory procedure; recommends an evaluation methodology outlines various ways of assessing impacts; and ends with recommendations for data collection, referencing and the establishment of an environmental data bank. (Zayac-NC)
W78-06775

WATER QUALITY ASSESSMENT FOR THE KANAWHA RIVER BASIN (NORTH CAROLINA, VIRGINIA, WEST VIRGINIA),
Environmental Protection Agency, Wheeling, WV. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5G.
W78-06778

ENVIRONMENTAL IMPACT AND RESOURCE MANAGEMENT PROBLEMS CAUSED BY RESERVOIR PROJECTS,
Iowa State Univ., Ames. Dept. of Botany and Plant Pathology.
R. Q. Landers, Jr.
Report presented at the Water Resources Engineering Conference, American Society of Civil Engineers, Washington, DC, Jan. 29 - Feb. 2, 1973. 18 p, 2 tab, 22 ref. OWRT A-039-IA(4), DACW 25-72-C-0033.

Descriptors: *Vegetation effects, *Reservoir construction, *Environmental effects, *Iowa, *Pre-impoundment, Skunk River(Iowa).

The proposed Ames Reservoir on the Skunk River near Ames, Iowa was the subject of an in-depth environmental resource and impact study, under which the impact of reservoir on the vegetation of the area is assessed. Reservoir construction would result in the introduction of an entirely new set of environmental conditions. Fifty plant community and land surface categories applicable to the central Iowa landscape were used in describing the general distribution of vegetation in the study area; vegetation was inventoried. Initial impact on vegetation during reservoir construction, changes in land use, effects of inundation, recovery processes of inundated areas (including successional changes and woody debris), and management of vegetation in the reservoir are discussed. (See also W74-02666) (Seip - IPA)
W78-06826

THE METULA OIL SPILL,
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Lab.
For primary bibliographic entry see Field 5B.
W78-06862

ENVIRONMENTAL QUALITY ASSESSMENT IN MULTIOBJECTIVE PLANNING,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
K. M. Duke, N. Dee, D. C. Fahringer, B. G. Maiden, and C. W. Moody.
Final Report, November 1977. 148 p, 15 fig, 1 tab, 10 ref, 2 append. Bur Reclam 6-07-DR-50150.

Descriptors: *Environmental quality assessment, *Environmental evaluation, Water resource planning, Recreation, Ecology, *Multiobjective planning, Environmental effects, Water Resources Council, Bureau of Reclamation, Methodology, *Water quality standards.

A methodology for environmental quality assessments is described which has been developed to implement the Principles and Standards developed by the Water Resources Council and Bureau of Reclamation Planning guidelines. A four level heirarchical structure for environmental quality account is described with 4 components, 15 categories, and 75 evaluation factors used to organize environmental measurements into a standard procedure for displaying the beneficial and adverse effects of water resource development projects on environmental quality. Examples of appropriate measurements for each evaluation category are provided along with suggested tables that might be used to display and summarize data used in the evaluation. The report also compares a number of other methodologies with the principles and standards previously developed by Bureau of Reclamation guidelines. (Bur Reclam)
W78-06905

STRESS AND RECOVERY OF AQUATIC ORGANISMS AS RELATED TO HIGHWAY CONSTRUCTION ALONG TURTLE CREEK, BOONE COUNTY, WEST VIRGINIA,
Geological Survey, Charleston, WV. Water Resources Div.
For primary bibliographic entry see Field 4C.
W78-06933

OFFSHORE OIL AND GAS EXTRACTION: AN ENVIRONMENTAL REVIEW,
Battelle Columbus Lab., OH.
For primary bibliographic entry see Field 5B.
W78-06983

THE ECOLOGY OF WYBUNBURY MOSS, CHESHIRE. II. POST-GLACIAL HISTORY AND THE FORMATION OF THE CHESHIRE MERE AND MIRE LANDSCAPE,
Wye Coll., Ashford (England).
B. H. Green, and M. C. Pearson.
Journal of Ecology, Vol 65, p 793-814, 1977. 8 fig, 33 ref.

Descriptors: *Bogs, *Peat, *Succession, *Submerged vegetation stage, *Marsh plants, *Stratigraphy, Wetlands, Fen, Lakes, Soil formation, Lake basins, Muck soils, Pollen, Distribution patterns, Lake stages, Pioneer stage, Emerging vegetation stage, Temporary pond stage, Environmental effects, Land subsidence, Salt, Sedimentary rocks, Aquatic plants, Geologic mapping, Soil profiles, *Peat profiles, Wynbunbury Moss(England).

An investigation was made of the hydroseral development of a deep basin mire of 'schwingmoor' structure with a floating raft of peat. The peat environments of the floating raft and mire system were analyzed by vegetative macro-remains, the chemical composition of several peat profiles, and by examination of a pollen profile. The results suggest that the mire may not have developed by straightforward hydroseral colonization of an open-water lake basin. Instead, subsidence brought about by natural means or by commercial solution of an underground salt strata has probably played a major part in creating and changing the basin and in directing the historic course of peat formation. Such is certainly known to be the case for some recent mere basins located in the nearby area. (Steiner-Mass)
W78-06984

A STUDY OF THE COMMON REEDGRASS (PHRAGMITES COMMUNIS TRIN.) IN THE COASTAL ZONE OF DELAWARE,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 2L.
W78-06993

ACCELERATION OF DESSICATION AND POPULATION TRAUMA IN SUB-SAHARAN AFRICA,
Indiana Univ., Bloomington. Dept. of Geography.
J. J. Hidore.
Water Resources Bulletin, Vol 13, No 4, p 783-794, August 1977. 6 fig, 23 ref.

Descriptors: *Africa, *Droughts, *Human population, Effects, Starvation, Colonization, Land use, Climatic regime, Precipitation(Atmospheric), Environmental degradation, Animals.

Drought has been a hazard in parts of Africa throughout historic times, and in all likelihood prior to that time as well. In recent years, the hazard of drought has been increasing in frequency and areal extent. A drought that occurred from 1968 to 1974 in Sub-Saharan Africa directly affected millions of people, directly or indirectly costing the lives of tens of thousands. The mechanism involved in the widespread problem is the manner of adjustment of the human population to climatic cycles of short duration in the face of rapidly growing human and animal numbers. A rapid collapse of the grasslands and an expansion of the Sahara Desert southward into more humid areas has resulted from the increasing pressure on the land from largely subsistence farming and herding. Present social, economic, and political conditions indicate that the process is going to continue to accelerate, affecting ever-increasing numbers of people in the Sub-Saharan Africa region. (Bell-Cornell)
W78-07036

A MANUAL OF MARSH AND AQUATIC VASCULAR PLANTS OF NORTH CAROLINA WITH HABITAT DATA,
North Carolina Agricultural Experiment Station, Raleigh.
For primary bibliographic entry see Field 2I.
W78-07062

EFFECTS OF GRASS CARP INTRODUCTION ON WATERFOWL HABITAT,
Florida State Game and Fresh Water Fish Commission, Lake Wales.
R. D. Gasaway, and T. F. Drda.
In: Trans. 42nd Wildl. Nat. Res. Conf., March 5-9, 1977, Atlanta, Georgia, p 73-85. 3 fig, 3 tab, 49 ref.

Descriptors: *Wildlife habitat, *Waterfowl, *Florida, Fish, Benthic fauna, *Carp, Submerged plants, Rooted aquatic plants, *Grass carp, *Habitat deterioration, Exotic species, Waterfowl foods.

Four sites in Florida were studied for three years. The first year served as a control (without grass carp), then the sites were stocked with 60 lbs. of grass carp per acre '67 kg/ha). Control exclosures were constructed in each pond. Submerged vegetation was eliminated in three of the four sites. Corresponding reductions in aquatic invertebrate populations, valuable as waterfowl food, also occurred. The quality of waterfowl habitat deteriorated after grass carp introduction in three of the four sites; trends in data indicate that the fourth site would have suffered extreme adverse effects if the study were continued over a longer period of time. (Stihler-Mass)
W78-07068

PHYSICAL MANAGEMENT OF COASTAL FLOOD PLAINS: GUIDELINES FOR HAZARDS AND ECOSYSTEMS MANAGEMENT.
Conservation Foundation, Washington, DC.
Task One Report, Prepared for the Council on Environmental Quality, December, 1977. 179 p, 86 ref.

Descriptors: *Coastal plains, *Conservation, *Water resources development, *Watershed management, Wetlands, Coastal engineering, Beaches, Dunes, Natural resources, Developed waters, Land management, Marsh management, Development guidelines, Conservation guidelines.

Focusing primarily on water systems and water-related aspects of the shoreline, development and conservation guidelines are developed for nine generalized 'places of concern.' All nine are distinguishable natural featurs of the coastal zone: (1) coastal watersheds, (2) shoreland water systems, (3) coastal floodlands, (4) saltwater wetlands, (5) bluffs, (6) dunes, (7) beaches, (8) basin floors, and (9) coastal waters. In each subsection are discussed, in sequence: characteristics and boundaries, ecological functions, and conservation guidelines and restoration techniques. The subsections are illustrated with examples that augment the text or illustrate special technical issues or processes. (Steiner-Mass)
W78-07077

ECONOMIC IMPLICATIONS OF ENVIRONMENTAL LEGISLATION FOR WETLANDS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6E.
W78-07080

ABUNDANCE AND PRODUCTION OF MACROINVERTEBRATES FROM NATURAL AND ARTIFICIALLY ESTABLISHED SALT MARSHES IN NORTH CAROLINA,
North Carolina State Univ. at Raleigh. Dept. of Zoology.
For primary bibliographic entry see Field 2L.
W78-07084

REVIEW OF ENVIRONMENTAL ISSUES OF TRANSPORTATION OF ALASKAN NORTH SLOPE CRUDE OIL,
MITRE Corp., McLean, VA. METREK Div.
R. D. Brown, and R. M. Helfand.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 088, Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA-600/7-77-046, May 1977. 123 p, 19 fig, 26 tab, 84 ref. 68-01-3188.

Descriptors: *Environmental engineering, *Environmental effects, *Oil transportation, Air pollution, Water quality, Oil spills, Alaska, *Crude oil.

A summary of information on transportation of Alaskan North Slope crude oil to U.S. markets focuses upon various factors contributing to the need for transporting the crude to areas outside of the West Coast; various alternatives proposed to distribute the excess oil; environmental issues related to such distribution; and the research and development needs in areas where data are incomplete with respect to environmental issues. Proposals for the eastward transport of crude oil in excess of West Coast demand are: (1) Canadian and U.S. pipelines to carry crude to Northern Tier States which face a decline in Canadian exports; (2) pipelines from California to midwestern states; (3) tanker traffic through a canal in Central America or around Cape Horn; and (4) exchange of oil with foreign countries. Environmental issues center on effects on air and water quality. Air pollution resulting from offloading, venting, purging, ballasting, and oil storage may require stringent mitigating measures or emissions tradeoffs. The water pollution level is dependent upon the risk of oil spills and probable oil spill trajectory associated with a particular alternative. Information is needed on: (1) how present decisions regarding pipeline routes may preclude future flexibility in meeting unanticipated supply and demand patterns; (2) how decisions related to the distribution of natural gas supplies affect the movement of crude oil; (3) the resolution of localized supply issues; (4) the need for well-documented air quality models describing impacts of marine oil terminals; (5) the development of a regulated West coast vessel traffic control system; and (6) how present decisions requiring measures to mitigate air impacts may shape future ventures. (Seip-IPA)
W78-07121

ENVIRONMENTAL ORIENTATIONS: CONTENT AND SOCIAL CLASS CORRELATES,
Iowa State Univ., Ames. Dept. of Sociology.
For primary bibliographic entry see Field 6B.
W78-07125

ENVIRONMENTAL IMPACT OF LAND USE ON WATER QUALITY (PROGRESS REPORT), BLACK CREEK PROJECT, ALLEN COUNTY, INDIANA,
Allen County Soil and Water Conservation District, Fort Wayne, IN.
J. Lake, and J. Morrison.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 963, Price codes: A04 in Paper copy, A01 in Microfiche. 1976. 53 p, 1 fig, 10 tab. EPA G005103.

Descriptors: *Water quality, *Environmental effects, *Land use, Planning, Sediment control, Agricultural chemicals, Sediment transport, Economics, Social aspects, *Indiana, Agricultural pollutants, *Black Creek Project(Ind).

The status of the Black Creek sediment control project, designed to determine the environmental impact of land use on water quality, is updated. The project is directed toward a determination of the role that agricultural pollutants play in the degradation of water quality in the Maumee River Basin and ultimately in Lake Erie. Topics include: (1) land treatment in Black Creek watershed - 1976 progress; (2) planning and application - changes in philosophy; (3) simulated rainfall status report; (4) conservation tillage trials; (5) nutrient transport during 1975; (6) sediment basins and channel stability studies; (7) filtering capacity of biota; (8) data acquisition processing and simulation; and (9) economic and social aspects. (Seip-IPA)
W78-07131

HABITAT DEVELOPMENT ASPECTS OF THE DREDGED MATERIAL RESEARCH PROGRAM,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
H. K. Smith.
In: Trans. 42nd Wildlife Natural Resources Conference, March 5-9, 1977, p 93-101, Atlanta, Georgia. 1 fig, 1 tab.

Descriptors: *Spoil banks, *Dredging, *Habitats, Coastal marshes, Wetlands, Wildlife, Marshes, Waste disposal, *Marsh development, *Dredged material research program, Spoil islands, Aquatic habitat development.

Habitat development using dredged materials offers an alternate disposal method which could, with careful implementation, significantly increase the extent of wetland and wildlife resources in many parts of the United States. Marsh development has received more attention than other alternatives, and techniques have been developed to enable careful planning, design, and propagation of these systems. Terrestrial habitat development consists primarily of estiblished wildlife management and soil reclamation procedures. Development of aquatic habitats on dredged materials appears to offer significant potential for the cretion of highly productive biological communities. Wildlife use and vegetative succession on dredged-material islands are currently being studied. (Stihler-Mass)
W78-07158

WATERFOWL POPULATIONS AS RELATED TO HABITAT CHANGES IN BOG WETLANDS OF THE MOOSEHORN NATIONAL WILDLIFE REFUGE,
Maine Cooperative Wildlife Research Unit, Orono.
For primary bibliographic entry see Field 4A.
W78-07164

7. RESOURCES DATA

7A. Network Design

CHICAGO AREA PROGRAM: A MAJOR NEW ATMOSPHERIC EFFORT,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W78-06885

7B. Data Acquisition

PASSIVE MICROWAVE MAPPING OF ICE THICKNESS,
Ohio State Univ., Columbus. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 2C.
W78-06728

SNOW BACKSCATTER IN THE 1-8 GHZ REGION,
Kansas Univ./Center for Research, Inc., Lawrence. Remote Sensing Lab.
For primary bibliographic entry see Field 2C.
W78-06731

THE USE OF LANDSAT DIGITAL DATA AND COMPUTER-IMPLEMENTED TECHNIQUES FOR AN AGRICULTURAL APPLICATION,
National Aeronautics and Space Administration, Houston, TX. Lyndon B. Johnson Space Center.
A. T. Joyce, and R. H. Griffin, II.
Available from the National Technical Information Service, Springfield, VA 22161 as NASA RP-1016, Price codes: A04 in paper copy, A01 in microfiche. Report No NASA RP-1016, 1978. 42 p, 9 fig, 6 tab, 10 ref, 3 append. 177-52-89-00-72.

Descriptors: *Satellites(Artificial), Data collections, Data transmission, Computer programs, Soil investigations, Soil classification, *Mississippi, Data processing, Agriculture, Estimating, Mapping, Crops, Wildlife, Reforestation, Sites, *LANDSAT, *Washington County(MS).

Agricultural application of a resource inventory system that combines Landsat-acquired data and soils information is described. The system was developed to aid county agents in routine work, to assess overall agricultural potential of a region, and to estimate upcoming harvest for major crops. The demonstration area was Washington County, Mississippi. The data processing flow involves: installing and operating the image display device; performing classification of Landsat raw data; performing rectification of information; mapmaking; applying the information (for acreage compilation, change detection, spatial analysis, and theme inventory); building the data base; digitizing other information (on soils, slope, elevation, rainfall, and accessibility); and making applications of the data base and materials to estimate crop production, assess wildlife habitat, inventory reforestation needs, and select sites for various projects. The results of the application are shown in production estimates for cotton and soybeans in the areas surveyed. Examples of output products in both line printer and map formats are included, and a product adequacy assessment is made. The appendices contain data forms, coding diagram and density plots, and computer requirements. (Wares-IPA)
W78-06767

RED RIVER CHLORIDE REMOTE SENSING STUDY: FINAL REPORT.
Army Engineer District, Tulsa, OK.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-11503, Price codes: A03 in paper copy, A01 in microfiche. Final Report, December 31, 1975. 47 p, 39 fig, 1 tab. NASA SR/T W-13,557.

Descriptors: *Remote sensing, *Aerial photography, *Radar, *Hydrogeology, *Saline water, *Water pollution, Texas, Oklahoma, Rivers, *Chlorides, *Red River(Tex-Okla), *Army Mohawk Group, *Saline river pollution, *Aerial sensing, Side looking radar, Infrared thermal imagery.

The results of a remote sensing program, conducted to augment the hydro-geologic investigation of a natural saline pollution problem that ex-

ists in the Red River (Texas and Oklahoma) and in its principal tributaries, are reported. The mission was flown for Tulsa District by the Army Mohawk Group out of Fort Huachuca, Arizona in July, 1973. The project was partially funded by NASA, with the concurrent goal of testing and evaluating remote sensing application to the District's mission according to the capabilities of Mohawk OV-1. The Program product consists of side looking radar, infrared thermal imagery, and color photography, with a few examples of black and white panoramic photos. The study area was explored by ground methods, and field data collections were also made. Analysis of both remote sensing and ground data had yielded a comprehensive picture of the hydro-geologic conditions. Examples of the remote sensing products acquired, their interpretation, and their use techniques are included. (Seip-IPA)
W78-06768

DIGITAL COMPUTER PROCESSING OF LANDSAT DATA FOR NORTH ALABAMA,
Computer Sciences Corp., Huntsville, AL.
For primary bibliographic entry see Field 7C.
W78-06770

REMARKS ON THE DETERMINATION OF THE UNSATURATED HYDRAULIC CONDUCTIVITY BASED ON FIELD MEASUREMENTS, (IN GERMAN),
For primary bibliographic entry see Field 2G.
W78-06774

THE UTILITY OF SKYLAB PHOTO-INTERPRETED EARTH RESOURCES DATA IN STUDIES OF MARINE GEOLOGY AND COASTAL PROCESSES IN PUERTO RICO AND THE VIRGIN ISLANDS,
Geological Survey, San Juan, PR.
For primary bibliographic entry see Field 5B.
W78-06867

GEOLOGICAL APPLICATIONS OF NIMBUS RADIATION DATA IN THE MIDDLE EAST,
National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center.
L. J. Allison.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-22584, Price codes: A05 in paper copy, A01 in microfiche. NASA Technical Note D-8469, April 1977. 82 p, 59 fig, 4 tab, 55 ref.

Descriptors: *Geologic investigations, *Satellites(Artificial), *Geological surveys, Water resources, *Geologic formations, Remote sensing, Data collections, Deserts, Geologic mapping, Geology, Limestones, Dolomite, *Nimbus satellite applications, *Egypt, *Middle Eastern deserts, *Ground radiation characteristics, *Saudi Arabia, *Nile Valley, Microwave radiation technique, Electrically scanning microwave radiometer, Temperature-humidity infrared radiometer.

Large plateaus of Eocene limestone and exposed limestone escarpments in Egypt and Saudi Arabia, respectively, were indicated by cool brightness temperatures (T sub B) (less than 240 to 265 K) recorded by the Nimbus-5 electrically scanning microwave radiometer (ESMR), over a 2-year period. Nubian sandstone, desert eolian sand, and igneous-metamorphic rock of the Pliocene, Miocene, Oligocene, and Cretaceous periods were differentiated from these limestone areas by warm T sub B values (more than 265 to 300 K). The brightness temperature differences are results of seasonal in-situ ground temperatures and differential emissivity of limestone (0.7) and sand, sandstone, and granite (0.9), whose dielectric constants are (6 to 8.9) and (2.9 and 4.2 to 5.3), respectively, at 19.35 GHz. Cool T sub B values in the form of a 'V' were found oriented N/S over broad areas of the Nile Valley, southward to Lake Nasser and NW/SE from the Kharga Oasis to the Baharia Oasis in the Western Desert of central Egypt. Surface moisture from subsurface leakage from the Aswan Dam and three Western Desert oases could be a secondary cause for this T sub B value drop. Similar cool T sub B values were shown over limestone-dolomitic hills of the Interior Homocline and the Hadramawt Plateau of Saudi Arabia. Nimbus-5 and -6 ESMR T sub B values selectively identified intermediate, dense rock types (limestone versus sandstone/granite) in the Lake Nasser region whose thermal inertia ranged from 0.035 to 0.06 ca/sq cm/degree C/sq root of time in sec. Space albedo was determined from spatially average (1-km resolution) LANDSAT-1, MSS-7(018 to 1.1 micrometer) data, and day-night ground brightness temperature differences from Nimbus-5 temperature-humidity infrared radiometer (THIR) 11 micrometer data (9-km resolution) under clear sky conditions. (Henley-ISWS)
W78-06869

SOIL MOISTURE GROUND TRUTH, STEAMBOAT SPRINGS, COLORADO, SITE, AND WALDEN, COLORADO, SITE, MARCH 8-10, 1976,
Bittinger (M.W.) and Associates, Inc., Fort Collins, CO.
For primary bibliographic entry see Field 2G.
W78-06870

INTERPRETATION OF THE TENSILE STRENGTH OF ICE UNDER TRIAXIAL STRESSES,
Cold Regions Research and Engineering Lab., Hanover, NH.
For primary bibliographic entry see Field 2C.
W78-06884

A FILTRATION UNIT FOR USE WITH CONTINUOUS AUTOANALYTICAL SYSTEMS APPLIED TO HIGHLY TURBID WATERS,
Institute for Marine Environmental Research, Plymouth (England).
For primary bibliographic entry see Field 5A.
W78-06894

CONTRIBUTION OF REMOTE SENSING TO HABITAT EVALUATION AND MANAGEMENT IN A HIGHLY ALTERED ECOSYSTEM,
Great Dismal Swamp National Wildlife Refuge, Suffolk, VA.; and Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-06935

DRAINAGE MAP OF ARIZONA SHOWING PERENNIAL STREAMS AND SOME IMPORTANT WETLANDS,
Arizona Game and Fish Dept., Phoenix; and Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06950

ELECTRODRIL DEMONSTRATION PROGRAM SHOWS PROMISE,
General Electric Co., Houston, TX.
For primary bibliographic entry see Field 8C.
W78-06961

APPLICATION OF BOREHOLE GEOPHYSICS TO SELECTION OF POTENTIAL SITES FOR DEEP-WELL DISPOSAL OF LIQUID WASTES,
For primary bibliographic entry see Field 5E.
W78-06972

SATELLITE REMOTE SENSING STUDY OF THE TRANS-BOUNDARY MOVEMENT OF POLLUTANTS,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 5A.
W78-06979

THE APPLICATION OF REMOTE SENSING TO THE DEVELOPMENT AND FORMULATION OF HYDROLOGIC PLANNING MODELS,
Ecosystems International, Inc., Gambrille, Md.
For primary bibliographic entry see Field 2A.
W78-07013

COMPARISON OF TWO METHODS USED BY DIVERS FOR SAMPLING BENTHIC INVERTEBRATES IN DEEP RIVERS,
Maine Univ. at Orono. Dept. of Entomology.
C. F. Rabeni, and K. E. Gibbs.
Journal of the Fisheries Research Board of Canada, Vol 35, p 332-336, 1978. 1 fig, 2 tab, 10 ref.

Descriptors: *Invertebrates, *Sampling, *Bottom sampling, *On-site data collections, *Benthos, *Benthic fauna, *Water quality, *Artificial substrates, *Bottom sediments, Rivers, Animal groupings, *Hess sampler.

A modified Hess sampler was developed to estimate standing crop and was compared with rock-filled basket samplers. The baskets, although biased for some invertebrates, consistently collected samplers. The baskets, although biased for some invertebrates, consistently collected more individuals and taxa. Both methods showed high efficiency as measured by the coefficient of variation, which generally decreased with increasing pollution. The relative proportions of each invertebrate group collected by each method were similar in many instances and each method was shown to be appropriate in deepwater situations, depending upon the goal of the study. (Deal - EIS)
W78-07025

THE RAIN PARAMETER DIAGRAM: METHODS AND APPLICATIONS,
Clemson Univ., SC. Dept. of Physics and Astronomy.
For primary bibliographic entry see Field 2B.
W78-07106

REMOTE SENSING DETECTS GROUNDWATER IN ENGLAND,
Institute of Hydrology, Wallingford (England).
A. G. P. Debney.
Water and Sewage Works, Vol. 125, No. 4, p 32-34, April 1978. 3 fig, 8 ref.

Descriptors: *Remote sensing, *Groundwater, *Aircraft, Infrared radiation, Springs, Seepage, Aquifers, Coasts, Shores, Lakes, Rivers, Discharge(Water), Water temperature, *England.

In England, remote sensing has been used successfully to detect aquifers and to determine the presence of groundwater. Successful detection has been achieved only where groundwater emerges from an aquifer to the surface. Thermal scanners operating in the middle infrared wavebands at 3 to 5 micrometers and 8 to 14 micrometers sense temperature differences between spring water and the surrounding water body. Remote sensing of groundwater is not yet a routine occurrence, and it probably will be some time before river surveys are used extensively in hydrogeological mapping. In the future, better ground resolution from satellites would promote this application, but the detection of groundwater bodies is still a long way off. (Sims-ISWS)
W78-07112

SCHEDULING OF NON-STATIONARY HOURLY PRECIPITATION,
Iowa Univ., Iowa City. Inst. of Hydrological Research.
For primary bibliographic entry see Field 2B.
W78-07124

APPLICATION OF LANDSAT SYSTEM FOR IMPROVING METHODOLOGY FOR INVENTORY AND CLASSIFICATION OF WETLANDS,
Fish and Wildlife Service, Jamestown, ND. Northern Prairie Wildlife Research Center.
D. S. Gilmer.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-21503, Price codes: A02 in paper copy, A01 in microfiche. Prepared for NASA Goddard Space Flight Center, Greenbelt, MD., April, 1977. 6 p, 2 fig, 2 ref.

Descriptors: *Ponds, *Surveys, *Remote sensing, Wetlands, Aerial photography, Water holes, Data collections, Satellites(Artificial), Analytical techniques, Sampling, Waterfowl, *North Dakota, *Stratum 46(ND), *LANDSAT, Breeding bird survey.

This project was an analysis of both LANDSAT and aircraft MSS data in a doubling sampling experiment designed to provide an estimate of the total number of water bodies within a 36,876 sq km area (Stratum 46, U.S. Fish and Wildlife Service Waterfowl Breeding Ground Survey) in southeastern North Dakota. Data collection involved the recording of aircraft MSS data in near synchronism with overpasses made by LANDSAT. LANDSAT provided an overall view of the entire stratum, whereas the aircraft data was obtained on a sampling basis. Standard statistical procedures were used to adjust the LANDSAT pond counts to actual pond numbers based on regression relationships established between the two sampling methods. Using the LANDSAT pond data the corrected pond numbers for Stratum 46 would be 168,813 (May) and 155,565 (July). These figures are 108 and 97 percent, respectively, of FWS pond number estimates which were based upon visual observations by low-flying aircraft. (Steiner-Mass)
W78-07143

USE OF LANDSAT DATA TO ASSESS WATERFOWL HABITAT QUALITY,
Environmental Research Inst. of Michigan, Ann Arbor.
J. E. Colwell, D. S. Gilmer, E. A. Work, Jr., D. L. Rebel, and N. E. G. Roller.
Environmental Research Institute of Michigan, Ann Arbor, January, 1978. 83 p, 28 fig, 6 tab, 1 append, 34 ref.

Descriptors: *Remote sensing, *Wetlands, *Ponds, *Wildlife management, *Waterfowl, *Reproduction, *Marshes, Freshwater marshes, Mapping, Census, Wildlife habitats, Satellites(Artificial), Productivity, Breeding, Brood stock, North Dakota, Landsat, Waterfowl habitat.

The feasibility of using Landsat data is examined for (1) the analysis of annual waterfowl production by monitoring the number of breeding and brood ponds that are present, and (2) the ability to assess waterfowl habitat based on various relationships between ponds and surrounding upland terrain types. A large coarse Landsat census can improve the estimate of the number of ponds in a population with respect to an accurate small sample done by low-flying aircraft. One reason is the large semi-random variability in pond area per small sample unit. In a multitemporal Landsat classification map, marsh categories were reasonably well recognized, although there was some misclassification between shallow and deep marsh. Bare soil was generally well recognized as were the other upland terrain classes. Landsat data may also determine waterfowl habitat quality, as related to pond and terrain conditions. A discussion of Landsat determination of pond area is included in an appendix. Some effects of size and shape are also indicated. (Steiner-Mass)
W78-07147

A TECHNIQUE FOR THE DETERMINATION OF LOUISIANA MARSH SALINITY ZONES FROM VEGETATION MAPPED BY MULTISPECTRAL SCANNER DATA: A COMPARISON OF SATELLITE AND AIRCRAFT DATA,
National Aeronautics and Space Administration, Houston, TX.
M. K. Butera.
Available from the National Technical Information Service, Springfield, VA 22161 as NASA THX-58203, Price codes: A04 in paper copy, A01 in microfiche. NASA Technical Memorandum 58203, August, 1977. 50 p, 12 fig, 9 tab, 19 ref.

Descriptors: *Marsh plants, *Louisiana, *Remote sensing, *Aerial photography, *Salinity, *Bioindicators, Wetlands, Natural resources, Marshes, Infrared radiation, Coastal marshes, Vegetation establishment, Distribution pattern, Salt marshes, Zoning, Mapping, Biogeography, Photogrammetry, LANDSAT, Pattern recognition, Salinity zones.

Vegetation in selected study areas on the Louisiana coast were mapped using low-altitude aircraft and satellite (LANDSAT) multispectral scanner data. Fresh, brackish, and saline marshes were then determined from the remotely sensed presence of dominant indicator plant associations. Such vegetational classifications were achieved from data processed through a standard pattern-recognition computer program. The marsh salinity zone maps from the aircraft and satellite data compared favorably within the broad salinity regimes. The salinity zone boundaries determined by remote sensing compared favorably with those interpolated from line-transect field observations from an earlier year. The advantage of the remotely sensed determination of zones is that it offers a greater confidence in product accuracy because of total area coverage with remotely sensed data can be used not only to determine salinity zones but also to derive probability and wildlife habitat maps for management practices and to detect changes. (Steiner-Mass)
W78-07148

APPLICATION OF LANDSAT DATA TO WETLAND STUDY AND LAND USE CLASSIFICATION IN WEST TENNESSEE,
Tennessee Univ. Space Inst., Tullahoma. Remote Sensing Div.
N. L. Jones, and F. Shahrokhi.
In: Proceedings of the Eleventh International Symposium on the Remote Sensing of the Environment, April 25-29, 1977, p 609-613. 3 fig, 1 tab.

Descriptors: *Wetlands, *Tennessee, *Remote sensing, *Land classification, Surveys, Census, Aerial photography, Mapping, Marsh management, Satellites(Artificial), Earth-water interfaces, Land use, Distribution patterns, Photogrammetry, Terrain analysis, Obion-Forked Deer River Basin(Tenn), LANDSAT.

The objective of this study was to demonstrate the application and utilization of LANDSAT data for determing land use of selected watershed areas, concentrating on the determination of wetland boundaries. Using densitometric methods on each of LANDSAT bands 4, 5, and 6, it was determined that wetland boundaries could be easily separated from forest and agricultural lands on band 6. However, urban areas could not be distinguished from wetland areas with this method. Therefore, urban areas as well as wetland boundaries were enhanced by using a multispectral additive color viewer. Mapping and classification techniques were used to determine the accuracy of LANDSAT and NASA high altitude imagery as compared to low altitude control data. LANDSAT can be used as well as high altitude photography for broad Level I classifications burt with a lesser degree of accuracy. High altitude photography has comparable accuracy with low altitude imagery, but does not provide the additional detail of Level II classification. LANDSAT data can be used effectively to determine wetland boundaries and to periodically measure remaining acreages, types of wetlands, and drainage trends. (Steiner-Mass)
W78-07152

REMOTE SENSING OF AQUATIC PLANTS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
K. S. Long, and L. E. Link, Jr.
In: Proceedings of the Eleventh International Symposium on the Remote Sensing of the Environment, April 25-29, 1977, p 817-825. 3 fig, 3 tab, 4 ref.

Descriptors: *Remote sensing, *Aquatic plants, *Distribution patterns, Wetlands, Aerial photography, Rooted aquatic plants, Aquatic environments, Mapping, Census, Aquatic weeds, Army Corps of Engineers.

This is a synopsis of the work being accomplished by the Army Corps of Engineers' Aquatic Plant Control Research Program on the remote sensing of aquatic plants, Initial study efforts have been to determine the feasibility of acquiring information concerning the extent and composition of aquatic plant assemblages by using currently available remote sensing procedures. Included are a literature review to identify current sensing work by other investigators and a discussion on future study efforts to be done in this field. Results to date have indicated that the sensor types best suited for assessment of aquatic environments are color, color infrared, and black-and-white infrared film, which furnish consistently high contrasts between aquatic plants and their surroudings. (Steiner-Mass)
W78-07153

THREE APPROACHES TO THE CLASSIFICATION AND MAPPING OF INLAND WETLANDS,
Geological Survey, Suffolk, VA.
P. T. Gammon, D. Malone, P. D. Brooks, and V. Carter.
In: Proceedings from the Eleventh International Symposium on the Remote Sensing of the Environment, April 25-29, 1977, p 1545-1555. 2 fig, 1 tab, 10 ref.

Descriptors: *Wetlands, *Aerial photography, *Remote sensing, *Mapping, Marshes, Swamps, Freshwater marshes, Marsh management, Census, Virginia, Tennessee, Florida, Marsh plants, Hydrology, Distribution patterns, Wetland classification, Color-infrared photography, Great Dismal Swamp(Virginia).

Three projects representing three approaches to the classification and mapping of inland wetlands are discussed. In the Dismal Swamp project, seasonal, color-infrared aerial photographs and LANDSAT digital data were interpreted for a detailed analysis of the vegetative communities in a large, highly altered wetland. In western Tennessee, seasonal high-altitude color-infrared aerial photographs provided the hydrologic and begetative information needed to map inland wetlands using a classification system developed for the Tennessee Valley Region. In Florida, color-infrared aerial photographs were analyzed to produce wetland maps using existing classification systems to evaluate the information content and mappability of each system. The methods used in each of the three projects can be extended or modified for use in the mapping of inland wetlands in other parts of the United States. (Steiner-Mass)
W78-07154

7C. Evaluation, Processing and Publication

PASSIVE MICROWAVE MAPPING OF ICE THICKNESS,
Ohio State Univ., Columbus. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 2C.
W78-06728

THE USE OF LANDSAT DIGITAL DATA AND COMPUTER-IMPLEMENTED TECHNIQUES FOR AN AGRICULTURAL APPLICATION,
National Aeronautics and Space Administration, Houston, TX. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 7B.
W78-06767

DIGITAL COMPUTER PROCESSING OF LANDSAT DATA FOR NORTH ALABAMA,
Computer Sciences Corp., Huntsville, AL.
A. D. Bond, R. J. Atkinson, M. Lybanon, and H. K. Ramapriyan.
Available from the National Technical Information Service, Springfield, VA 22161 as NASA-2932, Price codes: A13 in paper copy, A01 in microfiche. NASA Contractor Report No 2932, December, 1977. 276 p, 50 fig, 20 tab, 24 ref. NAS8-21805.

Descriptors: *Satellites(Artificial), *Computer programs, *Data processing, *Alabama, *Remote sensing, *Terrain analysis, *Land use, Analytical techniques, Mathematical studies, *LANDSAT, Computer processing, North Alabama, Mathematical analysis.

The computer processing of LANDSAT satellite data is described. The LANDSAT system is discussed in detail; the origin, type, and handling of its generated data are described. Also included are: (1) a description of the analysis procedures, (2) a description of the mathematical techniques, (3) results achieved for LANDSAT coverage of North Alabama, and (4) documentation of the major computer programs used in the analysis. (Seip-IPA)
W78-06770

FLOOD PLAIN INFORMATION: OHIO RIVER, CABEL COUNTY/WAYNE COUNTY, WEST VIRGINIA.
Army Engineer District, Huntington, WV.
For primary bibliographic entry see Field 4A.
W78-06795

FLOOD PLAIN INFORMATION: LITTLE PAPILLION CREEK AND SOUTH BRANCH, VOLUME II, OMAHA METROPOLITAN REGION, NEBRASKA.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-06796

FLOOD PLAIN INFORMATION: PAPILLION, BIG PAPILLION AND WEST PAPILLION CREEKS, VOLUME I, OMAHA METROPOLITAN REGION, NEBRASKA.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-06797

FLOOD PLAIN INFORMATION: THOMAS CREEK, COLE CREEK, HELL CREEK, WEST BRANCH PAPILLION CREEK EXTENSION, BIG PAPILLION CREEK EXTENSION, VOL. III, OMAHA METROPOLITAN REGION, NEBRASKA.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-06798

FLOOD PLAIN INFORMATION: ASHLAND, NEBRASKA, SALT CREEK, WAHOO CREEK.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-06799

FLOOD PLAIN INFORMATION: PLATTE RIVER, WARM SLOUGH, TROUBLE CREEK, CENTRAL CITY, NEBRASKA.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-06800

FLOOD PLAIN INFORMATION: GREAT FALLS, MONTANA, VOLUME I - SUN RIVER.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-06801

SPECIAL FLOOD HAZARD INFORMATION REPORT: GALLATIN RIVER, GALLATIN COUNTY, MONTANA.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-06802

FLOOD PLAIN INFORMATION: BIG THOMPSON RIVER, LOVELAND TO THE LARIMER-WELD COUNTY LINE, COLORADO, LITTLE THOMPSON RIVER, BOULDER AND LARIMER COUNTIES NEAR BERTHOUD, COLORADO.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-06803

UTILIZING CLIMATIC DATA TO APPRAISE POTENTIAL WATER YIELDS,
Kansas Univ., Lawrence. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W78-06850

GENERAL PURPOSE COMPUTER-AIDED ANALYSIS AND DESIGN OF TAINTER GATES; VOLUME I, THEORETICAL MANUAL,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 8C.
W78-06874

THE APPLICATION OF THE DIGITAL SIMULATION LANGUAGE PDEL TO SUBSURFACE HYDROLOGY PROBLEMS,
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 2F.
W78-06923

COMPUTER MODELING OF CUMULUS CLOUDS DURING PROJECT CLOUD CATCHER,
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
For primary bibliographic entry see Field 3B.
W78-06927

MEAN ANNUAL RUNOFF IN THE UPPER OHIO RIVER BASIN, 1941-70, AND ITS HISTORICAL VARIATION,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-06932

DIRECTORY OF LOCAL ASSISTANCE CENTERS OF THE NATIONAL WATER DATA EXCHANGE (NAWDEX),
Geological Survey, Reston, VA. Water Resources Div.
M. D. Edwards.
Open-file report 78-162, 1978, 10 p.

Descriptors: *Data storage and retrieval, *Water resources, *Bibliographies, *Information retrieval, *Information exchange, Methodology, *National Water Data Exchange(NAWDEX), *Directory, Local assistance centers.

The National Water Data Exchange (NAWDEX), managed by the U.S. Geological Survey, has established a network of Local Assistance Centers throughout the United States and Puerto Rico to assist users of water data in identifying and locating the data they need. This up-dated Directory provides the information needed to contact any of the established Centers. (Woodard-USGS)
W78-06940

DRAINAGE MAP OF ARIZONA SHOWING PERENNIAL STREAMS AND SOME IMPORTANT WETLANDS,
Arizona Game and Fish Dept., Phoenix; and Geological Survey, Tucson, AZ. Water Resources Div.
D. E. Brown, N. B. Carmony, and R. M. Turner.
Arizona Game and Fish Department Map, 1977. 1 sheet.

Descriptors: *Maps, *Perennial streams, *Wetlands, *Riparian plants, *Arizona, Soil-water-plant relationships, Riparian waters, Management, Ecosystems, *Riparian habitat inventory.

This state map, scale 1:1000,000, of Arizona's perennial streams and wetlands is based on perennial streams rather than riparian vegetation because the streams are of more direct biotic significance and more readily identifiable. The categories described are (1) unregulated perennial streams, (2) regulated perennial streams, and (3) reaches of streams containing only waste-water discharge. The inventory procedures believed to be applicable to other Southwestern States and should prove useful in the delineation of their aquatic, riparian, and wetland biotic resources. (Woodard-USGS)
W78-06950

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1976--VOLUME 1. NORTHEAST FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 767, Price codes: A25 in paper copy, A01 in microfiche. Water-Data Report FL-76-1, September 1977. 587 p, 23 fig, 1 tab, 48 ref.

Descriptors: *Florida, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Northeast Florida.

Water resources data for the 1976 water year in northeast Florida consist of discharge records for 59 streams, stage-only records for 12 streams, elevations for 67 lakes, and daily water level measurements for 113 wells. Water quality data for approximately 220 surface sites and 700 wells are included; as are 2 miscellaneous measurements, 25 crest-stage partial records, and 8 annual maximum flood profile measurements. These data represent the National Water Data System records collected by the U.S. Geological Survey and cooperating local, State and Federal agencies in Florida. (Woodard-USGS)

W78-06952

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1976--VOLUME 2. SOUTH FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 898, Price codes: A99 in paper copy, A01 in microfiche. Water-Data Report FL-76-2, (Two reports), October 1977. 1140 p, 19 fig, 1 tab, 46 ref.

Descriptors: *Florida, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *South Florida.

Water resources data for the 1976 water year in south Florida consist of discharge records for 76 streams, stage-only records for 74 streams, elevations for 21 lakes, and daily water-level measurements for 353 wells. Water quality data for more than 370 surface-water sites and 500 wells are included. Also, included are miscellaneous measurements and crest-stage partial records. The report is contained under two separate covers: Pages 1 to 634 and pages 635 to 1140. These data represent the National Water Data System records collected by the U.S. Geological Survey and cooperating local, State and Federal agencies in Florida. (Woodard-USGS)
W78-06953

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1976--VOLUME 4. NORTHWEST FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 768, Price codes: A22 in paper copy, A01 in microfiche. Water-Data Report FL-76-4, September 1977. 523 p, 27 fig, 1 tab, 48 ref.

Descriptors: *Florida, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Northwest Florida.

Water resources data for the 1976 water year in northwest Florida consist of discharge records for 84 streams, elevations for 27 lakes, daily water level measurements for 110 wells and water-quality data for approximately 220 surface sites and 170 wells. Miscellaneous measurements and crest-stage partial records are included. These data represent the National Water Data System records collected by the U.S. Geological Survey and cooperating local, State and Federal agencies in Florida. (Woodard-USGS)
W78-06954

INVENTORY OF RIPARIAN HABITATS,
Arizona Game and Fish Dept., Phoenix; and Geological Survey, Tucson, AR. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-06955

MISSISSIPPI FLORA. IV. DICOTYLEDON FAMILIES WITH AQUATIC OR WETLAND SPECIES,
Georgia Univ., Athens. Dept. of Botany.
For primary bibliographic entry see Field 2I.
W78-06985

THE APPLICATION OF REMOTE SENSING TO THE DEVELOPMENT AND FORMULATION OF HYDROLOGIC PLANNING MODELS,
Ecosystems International, Inc., Gambrille, Md.
For primary bibliographic entry see Field 2A.
W78-07013

ON SOME MULTI-SITE MULTI-SEASON STREAMFLOW GENERATION MODELS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 2A.
W78-07014

APPLICATION OF THE KALMAN FILTER TO CYCLONE FORECASTING 3. HURRICANE FORECASTING 4. ADDITIONAL TYPHOON FORECASTING,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 2B.
W78-07015

OPTIMAL FLOOD LEVEE DESIGNS BY DYNAMIC PROGRAMMING,
Water Resources Center, Budapest (Hungary).
For primary bibliographic entry see Field 8B.
W78-07017

PENN STATE RUNOFF MODEL FOR THE ANALYSIS OF TIMING OF SUBWATERSHED RESPONSE TO STORMS,
Weston (Roy F.), Inc., West Chester, PA.
For primary bibliographic entry see Field 5G.
W78-07060

PUBLIC GROUNDWATER SUPPLIES IN EDWARDS COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W78-07085

A NEW MULTIVARIATE GAMMA DISTRIBUTION AND ITS FITTING TO EMPIRICAL STREAMFLOW DATA,
Technical Univ. of Budapest (Hungary). Dept. of Mathematics.
For primary bibliographic entry see Field 2E.
W78-07089

GEOGRAPHIC INVESTIGATIONS OF SNOW AVALANCHES AND MUDFLOWS,
Moscow State Univ., Moscow (USSR), Lab. of Snow Avalanche and Mudflow Problems.
For primary bibliographic entry see Field 2C.
W78-07117

QUALITY ASSURANCE PRACTICES AND PROCEDURES,
Environmental Protection Agency, Chicago, IL. Central Regional Lab.
For primary bibliographic entry see Field 5A.
W78-07129

MONITORING TO DETECT PREVIOUSLY UNRECOGNIZED POLLUTANTS IN SURFACE WATERS, (TEXT AND APPENDIX: ORGANIC ANALYSIS DATA),
Illinois Univ. at Urbana-Champaign. Inst. for Environmental Studies.
For primary bibliographic entry see Field 5A.
W78-07130

USE OF LANDSAT DATA TO ASSESS WATERFOWL HABITAT QUALITY,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 7B.
W78-07147

STATUS OF THE NATIONAL WETLANDS INVENTORY,
Fish and Wildlife Service, St. Petersburg, FL.
J. A. Montanari, and J. E. Townsend.
In: Trans. 42nd North American Wildlife Nat. Res. Conference, March 5-9, 1977, Atlanta, Georgia. p 66-72. 4 ref.

Descriptors: *Wetlands, United States, Remote sensing, Maps, Data storage and retrieval, Inventory, *National Wetland Inventory, *Classification system, Wetlands protection guidebook.

The National Wetlands Inventory (WI) will produce a universally applicable system of highly accurate wetland information describing all wetlands of the United States. Pre-operational products include a new wetland classification system; a national survey of existing wetland inventories; a national atlas of recent, high altitude aerial photography; a national series of maps delineating ecoregions, physical divisions and land surface form; and a wetland protection guidebook. The operational phase started in October, 1976, and will take three years to complete. It will produce: the NWI map series; a NWI data bank; regional and national summary reports; and an indexed set of work materials and collateral data available for limited use. (Stihler-Mass)
W78-07159

HISTORICAL STREAMFLOW SUMMARY, ALBERTA, TO 1976.
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
1977. 374 p, in English and French.

Descriptors: *Streamflow, *Water resources, *Hydrologic data, *Data collections, Networks, Surface water, Publications, Surveys, *Canada, *Alberta, Historical data, Hydrometric data, Stream discharge, 1976.

This report contains a summary of monthly and annual mean discharges and annual extremes of discharge for rivers in Alberta. The data covers that collected by the Water Survey of Canada up to 1976. The location of the station, drainage area, and whether the flow is natural or regulated are noted. Besides the monthly and annual means, maximum instantaneous discharges, the extreme for the period of record, and the annual total discharge are provided for most stations. (WATDOC)
W78-07165

GLACIER SURVEYS IN BRITISH COLUMBIA - 1972,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 2C.
W78-07169

8. ENGINEERING WORKS

8A. Structures

SAFETY OF DIKES AGAINST STORM TIDES AND WAVE RUNUP,
Department of Coastal Protection, Aurich (West Germany).
For primary bibliographic entry see Field 8B.
W78-06714

GUIDELINES FOR THE DESIGN, CONSTRUCTION AND OPERATION OF TAILING PONDS AND DAMS,
Chafet (Arthur B.) and Associates, Denver, CO.
A. B. Chafet.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 489.

Price codes: A02 in paper copy, A01 in microfiche. January, 1974. 10 p, 44 ref.

Descriptors: *Design, *Design standards, *Design criteria, *Dams, Damsites, Ponds, Construction, Operation and maintenance, Slurries, Soil dynamics, Hydrology, Sites, Pressure, Planning, Tailings, *Tailing ponds.

The basic principles that apply to the design of any water dam are applied as guidelines for the design, construction, and operation of tailing ponds and dams. In some instances, tailing dams must be designed so that: (1) a slurry with a relatively high density and pressure can be maintained; and (2) gravity dewatering can be accomplished through planned leakage. Principles for selection of site and design of facilities are presented, stressing the need to consider abandonment and final stabilization of the pond and dam area at the time of determining original design criteria. Criteria are described for effluent release and treatment; flooding; proximity to public transportation; aesthetics; topography; geology; hydrology; soil parameters; proximity to mines, geologic faults, and outcrops; provision for inspection; construction materials; earthquakes and liquefaction; water drainage and/or diversion; decanting; pumping; waste deposition and disposal; instrumentation; and consultation on design in accordance with ordinances and regulations. (Wares-IPA)
W78-06813

$70 MILLION FOR DAM INSPECTIONS,
For primary bibliographic entry see Field 8G.
W78-06892

BUREAU OF RECLAMATION ECONOMIC ASSESSMENT MODEL (BREAM), TECHNICAL DESCRIPTION.
Mountain West Research, Inc., Tempe, AZ.
For primary bibliographic entry see Field 6A.
W78-06903

CONTROL OF TURBIDITY AT CONSTRUCTION SITES.
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 5G.
W78-06904

GEOTHERMAL WELL COMPLETION,
Texas Univ. at Austin. Center for Energy Studies.
W. E. Boyd, and M. H. Dorfman.
Drilling DCW, Vol. 39, No. 5, p 30-35, March, 1978. 3 fig, 1 tab.

Descriptors: *Geothermal wells, *Geopressured zone, *Deep wells, *Rotary drilling, Well casings, Cement grouting, Logging(Recording), Drilling equipment, Steel pipes, Sands, Gulf Coastal Plain, Perforation.

Geological assessment studies indicate that commercially attractive geothermal-geopressured resources exist in several areas of the Gulf Coast at depths of 12,000 to 20,000 feet. Drilling machinery, tools and equipment for deep wells have now been developed to the extent that they are considered quite satisfactory for the loads, pressures, and temperatures to be encountered in 20,000 feet geothermal wells. The wellhead assembly for a typical completion would be a 20 x 13 3/8 x 9 5/8 x 5 1/2 inch, 15,000 psi working pressure assembly. Casing would consist of three strings to the surface plus liner plus the 5 1/2 inch tubing. Cement bond logs should be run during completion procedures to locate any channels or gaps in the cement sheath. It is currently deemed preferable to perforate casing at a wellbore pressure somewhat less than formation pressure. Perforation should be started from the lowest producing interval and proceed upwards to enable successive runs at shallower depths. A perforated casing gravel-pack can be used to control sand should sand pumping problems arise. (Eberle-NWWA)
W78-06959

8B. Hydraulics

SAFETY OF DIKES AGAINST STORM TIDES AND WAVE RUNUP,
Department of Coastal Protection, Aurich (West Germany).
J. Kramer.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol 104, No WW1, Proceedings Paper 13561, p 1-10, February 1978. 10 fig, 1 tab, 6 ref, 1 append.

Descriptors: *Dikes, *Safety, *Shore protection, *Storms, Tides, Surges, Floods, Waves(Water), Coasts, Coastal structures, Embankments, Engineering structures, Damages, Costs, Construction costs, Design, Coastal engineering, *Germany, Wave runup.

The safety of sea dikes against storm tides was related to the geometric and storm parameters. The parameters were the rising storm tide levels, wave runup, over-topping by waves, repair of damages in the period between storm tides, dimensions of the dike, construction and maintenance features, and costs of the various types of dikes. The analysis showed that the safety of dikes has been continuously increased since 1800 and that the most economical form of a new dike is the dike without foreland. (Sims-ISWS)
W78-06714

ICE SHEET LOADS ON MARINA PILES,
Federal Highway Administration, Springfield, IL. Illinois Div.
J. O. Doud.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 104, No. WW1, Proceedings Paper 13522, p 11-17, February 1978. 7 fig, 6 ref, 1 append.

Descriptors: *Ice, *Michigan, *Ice loads, *Piles(Foundations), *Marinas, Instrumentation, On-site investigations, Loads(Forces), Damages, Ice cover, Ice jams, Uplift pressure, Water levels, Water level fluctuations, Recreational facilities.

Two marina piles were instrumented with steel sleeves. The steel sleeves were fixed rigidly to the top of the piles. The bottoms of the sleeves were free to freeze into the ice sheet. Two transducers were placed on each sleeve above the water level to measure the tension and compression forces imposed on the pile by the ice sheet. The testing took place during two winters at Ontonagon, Michigan. It was found that the fluctuating water level in the lake can produce large cycling loads and that the vertical loading rate that an ice sheet imposes on a marina pile can be significant. (Sims-ISWS)
W78-06715

A LOOK AT COASTAL ENGINEERING STUDY IN JAPAN.
Japan Society of Civil Engineers, Tokyo. Committee on Coastal Engineering.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 104, No. WW1, Proceedings Paper 13532, p 19-38, February 1978. 7 fig, 13 ref, 1 append.

Descriptors: *Coastal engineering, *Reviews, *Conferences, *Foreign research, Waves(Water), Ocean waves, Tsunamis, Sediments, Littoral drift, Beaches, Coastal structures, Breakwaters, Offshore platforms, Harbors, Environment, Environmental effects, Water quality, Coasts, Engineering, *Bibliographies, *Japan.

A review was made of 112 papers presented at the 23rd annual National Conference on Coastal Engineering in Japan, 1976. Papers of interest were introduced briefly according to the subjects of waves, coastal sediment problems and beach process, coastal and offshore structures, tsunami and harbor oscillations, environmental problems and miscellaneous problems. (Sims-ISWS)
W78-06716

MODIFIED HAZEN-WILLIAMS FORMULA,
Roorkee Univ. (India). Dept. of Civil Engineering.
A. K. Jain, D. M. Mohan, and P. Khanna.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 104, No. EE1, Proceedings Paper 13544, p 137-146, February 1978. 2 fig, 6 tab, 12 ref, 2 append.

Descriptors: *Pipe flow, *Pipelines, *Hazen-Williams equation, *Model studies, Mathematical models, Fluid friction, Flow friction, Equations, Flow, Pipes, Hydraulic radius, Velocity, Discharge(Water), Hydraulics.

The limitations of Hazen-Williams formula, which is widely used by the environmental engineers, were identified in quantitative terms. An accurate formula, similar to that of Hazen-Williams, based on explicit relationship for pipe diameter and Colebrook's equation for friction factor, was obtained. A nomograph based on the proposed formula was presented in a readily usable form. (Sims-ISWS)
W78-06717

WAVE RUNUP AROUND LARGE CIRCULAR CYLINDER,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
M. de St. Q. Isaacson.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 104, No. WW1, Proceedings Paper 13563, p 69-79, February 1978. 5 fig, 13 ref, 2 append.

Descriptors: *Waves(Water), *Coastal engineering, *Structures, *Model studies, Mathematical models, Coastal structures, Offshore platforms, Ocean waves, Laboratory tests, Theoretical analysis, Oceans, Oceanography, Wave runup, Wave theories.

The wave runup around a large circular cylinder was considered. Predictions based on both sinusoidal and cnoidal wave diffraction theories were summarized and compared with experimental data obtained under conditions close to the shallow water range. The cnoidal theory was found to predict the measured runup profiles more closely than does the linear theory, although the measured maximum runups were still significantly greater than either prediction. (Sims-ISWS)
W78-06718

APPROXIMATE METHOD FOR COMPUTING BACKWATER PROFILES IN CORRUGATED METAL PIPES,
Federal Highway Administration, Washington, DC. Hydraulic Research.
P. N. Zelensky.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 915. Price codes: A04 in paper copy, A01 in microfiche. Report No FHWA-RD-76-42, April 1976. 45 p, 14 fig, 3 tab, 14 ref, 2 append.

Descriptors: *Backwater, *Flow profiles, *Culverts, *Pipe flow, *Methodology, Specific head, Hydraulics, Subcritical flow, Slopes, *Corrugated metal pipes, Drainage structures.

Corrugated metal pipes often are used in the construction of highways as drainage structures such as culverts and storm drains. Subcritical backwater curve M2 occurs in a long conduit on a mild slope, terminating abruptly into an enlarged channel cross section. Charts and tables were

presented for certain range of discharge, pipe slope, and relative flow depth. These data can be used in determining the depth of flow, velocity head, and specific head at various points along the backwater curve. The effects of flow parameter variations on the shape and extent of the backwater profile can be assessed. (Singh-ISWS)
W78-06722

HIGHWAYS IN THE RIVER ENVIRONMENT--HYDRAULIC AND ENVIRONMENTAL DESIGN CONSIDERATIONS (TRAINING AND DESIGN MANUAL),
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
E. V. Richardson, D. B. Simons, S. Karaki, K. Mahmood, and M. A. Stevens.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 090, Price codes: A21 in paper copy, A01 in microfiche. Report FHWA-NHI-76-N005, May 1975. 475 p, 159 fig, 31 tab, 113 ref, 3 append. DOT-FH-11-8101.

Descriptors: *Rivers, *Highways, *Hydraulics, *Design, Environment, Flow, Publications, Open channel flow, Unsteady flow, Steady flow, Channel flow, Alluvial channels, Sediments, Sediment transport, Geomorphology, Bank stability, Bank protection, Riprap, Scour, Meanders, River systems.

Through a coordinated effort between the Federal Highway Administration and Colorado State University, a training course was developed (1) to provide training in the practical application of the concepts of open channel flow, fluvial geomorphology, and river mechanics to the planning, location, design, construction, maintenance and operation of highways; and (2) to enable the participants to apply these concepts to environmental problems associated with highway crossings and encroachments. This two-week course was oriented to graduate engineers who have had training in basic hydraulics. This 'Training and Design Manual' was developed to serve as a text for the course. The manual had eight chapters which were titled: Introduction; Open Channel Flow; Fundamentals of Fluvial Geomorphology; River Mechanics; River Stabilization, Bank Protection and Scour; Needs and Sources for Data; and Hydraulic and Environmental Considerations of Highway River Crossings and Encroachments. (Sims-ISWS)
W78-06730

GUIDELINES FOR THE DESIGN, CONSTRUCTION AND OPERATION OF TAILING PONDS AND DAMS,
Chafet (Arthur B.) and Associates, Denver, CO.
For primary bibliographic entry see Field 8A.
W78-06813

GENERAL PURPOSE COMPUTER-AIDED ANALYSIS AND DESIGN OF TAINTER GATES; VOLUME I, THEORETICAL MANUAL,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 8C.
W78-06874

A DISTRIBUTED KINEMATIC MODEL OF UPLAND WATERSHEDS,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 4D.
W78-06876

MODULATION OF COHERENT MICROWAVE BACKSCATTER BY SHOALING WAVES,
Naval Research Lab., Washington, DC. Ocean Sciences Div.
For primary bibliographic entry see Field 2L.
W78-06889

ESTIMATING TRANSMISSIVITY AND STORAGE COEFFICIENT FROM ABSTRACTION WELL DATA,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W78-06897

COMPUTATION OF THE ROUGHNESS OF GRASS COVERS OF DRAINAGE CHANNELS,
V. A. Korneyev, A. F. Dmitriyev, V. A. Pozdin, and P. V. Grindshpun.
Soviet Hydrology: Selected Papers, Vol. 15, No. 2, p 167-168, 1976. 4 fig. Translated from Gidrotekhnika i Melioratsiya, No. 3, p 67-69, 1976.

Descriptors: *Grassed waterways, *Drainage, *Roughness(Hydraulic), *Laboratory tests, Roughness coefficient, Grasses, Flow, Flow friction, Fluid friction, Equations, Data processing, Channels, Channel flow, Hydraulics.

The roughness of the bottom and sides of a channel with a grass cover must differ from that of an earth channel. To determine the range of variation of the roughness coefficient as a function of the depth, velocity, and slope of flow for channels with a grass cover, a grass cover in a laboratory flume was investigated. To simulate the grass cover, grass carpets were used. The roughness coefficients were determined for six different covers of varying length, density, and degree of preservation of the grass cover. Each cover was studied for slopes from 0.0025 to 0.04 and discharges from 5 to 190 liters/sec. It was found that a grass cover offers considerable resistance to water flow in channels. This must be taken into account in planning. The value of the roughness coefficient in channels overgrown with grass depends on the transverse dimensions of the channels and flow velocity. Roughness decreases with increasing velocity. (Sims-ISWS)
W78-06901

IDENTIFICATION OF RELEVANT CRITERIA AND SURVEY OF POTENTIAL APPLICATION SITES FOR ARTIFICIAL HABITAT CREATION, VOLUME II, SURVEY OF POTENTIAL APPLICATION SITUATIONS AND SELECTION AND DESCRIPTION OF OPTIMUM PROJECT AREAS.
Coastal Zone Resources Corp., Wilmington, NC.
For primary bibliographic entry see Field 2L.
W78-06902

MODULUS OF SOIL REACTION (E') VALUES FOR BURIED FLEXIBLE PIPE,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 8D.
W78-06929

STOCHASTIC ANALYSIS OF PARTICLE MOVEMENT OVER A DUNE BED,
Geological Survey, Bay St. Louis, MS. Water Resources Div.
For primary bibliographic entry see Field 2J.
W78-06948

AN INTRODUCTION TO THE TECHNOLOGY OF SUBSURFACE WASTEWATER INJECTION,
Missouri Univ.-Rolla; and National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 5E.
W78-06965

GEOTHERMAL RESERVOIR AND WELL TEST ANALYSIS: A LITERATURE SURVEY,
Hawaii Univ.-Hilo Coll., Hilo.
B. Chen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 692, Price codes: A03 in paper copy, A01 in microfiche. Hawaii Geothermal Project Engineering Program Technical Memorandum No 2, September, 1974. 8 fig, 22 ref.

Descriptors: *Geothermal reservoirs, *Well tests, Equations, Permeability, Porosity, Conductivity, Fluid flow, Heat transfer, Viscosity, Pressure, Steam, Thermal water, Mathematics.

Parameters such as formation thickness, permeability, porosity, viscosity, compressibility, thermal conductivity, fluid and rock density, and temperature are crucial in assessing the potential and behavior of a geothermal reservoir. Perhaps even more important are pressure data, which can be used to relate production per unit time to pressure drop and further used in materials-heat balance calculations of geothermal liquid in place. This report deals with the analysis of the temperature, flow, and pressure measurements necessary for reservoir evaluation. Detailed discussion is presented of the equations involved in well interference tests, wellbore storage and skin effects, determination of reservoir boundaries, pressure drawdown and buildup tests, and two phase flow. The assumption of little or no heat transfer in a geothermal reservoir (thus regarding the reservoir as one with isothermal fluid flow) makes petroleum well test analysis techniques applicable with very little modification. (Eberle-NWWA)
W78-06967

OPTIMAL FLOOD LEVEE DESIGNS BY DYNAMIC PROGRAMMING,
Water Resources Center, Budapest (Hungary).
I. Bogardi, A. Casti, J. Casti, and L. Duckstein.
Research Memorandum RM-77-12, International Institute for Applied Systems Analysis, Laxenburg, Austria, March 1977. 13 p, 2 tab, 11 ref.

Descriptors: *Levees, *Design, *Flood protection, *Dynamic programming, *Cost minimization, *Methodology, Optimization, Benefit-risk analysis, Loss minimization, Rivers, Design flood, Flood waves, Stochastic processes, Failure modes, Flood routing, Equations, Mathematical models, Systems analysis.

An economic optimum development of a levee system along a river is investigated and a dynamic programming (DP) approach is used to derive the optima under various conditions. The system consists of a number of levee reaches or stages. A random input of flood wave is regarded at the upstream point of the system. There are two failure modes considered and, consequently, two parameters of the flood wave (state variables) to trigger failure modes in every stage. Stochastic DP is used since the state transition functions (flood routing along the stages) are random functions. Three methods are discussed. In Method I, the expected value of the objective function is taken first, then DP is used as a numerical technique. In Method II, a fixed design flood is chosen as an input under which both least cost and policy are determined. In Method III, the value of the expected optimum objective function is calculated. It is shown that the full power of DP cannot be used if Method I is applied. Future research involves comparing the solutions of the three methods. (Bell-Cornell)
W78-07017

STUDY OF THE INTERMITTENT STREAMFLOW IN AN OPEN CHANNEL,
Gdansk Technical Univ. (Poland).
For primary bibliographic entry see Field 5E.
W78-07053

8C. Hydraulic Machinery

GENERAL PURPOSE COMPUTER-AIDED ANALYSIS AND DESIGN OF TAINTER GATES; VOLUME I, THEORETICAL MANUAL,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
L. Z. Emkin.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 854, Price codes: A08 in paper copy, A01 in microfiche. Contract Report K-76-1, August 1976. 161 p, 11 fig, 9 tab, 11 ref, 8 append. DACW39-76-M-0869, DACW39-76-M-2230.

Descriptors: *Radial gates, *Hydraulic structures, *Finite element analysis, *Hoisting machinery, *Structural analysis, *Computer programs, Analytical techniques, Methodology, Mathematics, *Seal friction, Trunnion pin friction.

A method was formulated for analyzing and designing tainter gate hydraulic structures by a general purpose, structural analysis and design computer system. The publication included a discussion of tainter gate design criteria, including the effects of hoisting cables, side seal friction, trunnion pin friction, sideway constraint limit, and their application, followed by the development of a computerized procedure for tainter gate analysis and design. The formulated analysis procedure for the tainter gate involves a superposition of results from a variety of different load cases and even different boundary conditions. The linear combination factors for the superposition are computed by solving highly nonlinear systems of equations. The finite element analysis was used for the design of the skin plate of the tainter gate. (Sinhg-ISWS)
W78-06874

ESTIMATING REVERSIBLE PUMP-TURBINE CHARACTERISTICS,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
R. S. Stelzer, and R. N. Walters.
Water Resources Technical Publication, Engineering Monograph No. 39, December 1977. 40 p, 23 fig, 6 tab, 35 ref.

Descriptors: *Pumped storage, *Pump turbines, Powerplants, *Reversible turbines, Francis turbines, Pumps, Power head, Turbine efficiency, Specific speed, Cavitation index, Hydraulic machinery, Design criteria, Flatiron Powerplant(CO), Mt. Elbert Pumped-Storage Powerplant(CO), Grand Coulee Pumping Plant(WA), San Luis Pumping-Generating, Senator Wash Dam(CA).

Guidelines are presented for designers who plan or maintain pump-turbine installations. Data are presented on recent installations of pump-turbines which include figures showing operating characteristics, hydraulic performance, and sizing of the unit. Specific speed, impeller/runner diameter, and the best efficiency head and discharge were selected as the criteria that characterize the unit performance. (Bur Reclam)
W78-06928

ELECTRODRIL DEMONSTRATION PROGRAM SHOWS PROMISE,
General Electric Co., Houston, TX.
B. V. Traynor, Jr.
Oil and Gas Journal, Vol. 76, No. 16, p 108-129, April 17, 1978. 12 fig.

Descriptors: *Drilling, *Downhole motors, *Telemetry, Electric motors, Monitoring, Instrumentation, Prototype testing, Geothermal studies.

General Electric's Electrodril system is based on down-hole electric motor research which began in the late 1950's. A field testing program of the system is not being sponsored by the Geothermal Division as well. The Electrodril is designed as a modular add-on to conventional drilling rigs. Two basic configurations currently exist, a 60-hp motor system designed primarily for use in directional drilling applications, and a 285-hp motor for drilling deep, tough formations. The motor system is combined with a down-hole instrumentation package which provides real-time data acquisition and telemetry of 15 analog plus 11 digital parameters to the surface. System design is considered adequate for depths to 20,000 ft., pressures up to 20,000 psig, and temperatures of as much as 125C. Projected benefits include increased penetration rate over conventional systems, reduced tripping resulting from improved formation sensing and directional control, and greater ability to sense blowout conditions as they ae encountered at the bit face. (Eberle-NWWA)
W78-06961

UPDATE ON GEOTHERMAL DRILLING,
W. A. Glass.
Drilling Contractor, Vol. 34, No. 2, p 81-84, March-April, 1978. 3 tab.

Descriptors: *Geothermal wells, *Drilling, Thermal power, Electric power production, Costs, Economics, Brines, Steam, The Geysers(Calif), Imperial Valley(Calif), *California.

While the cost of geothermal wells is greater than that of oil and gas wells under similar conditions, costs of geothermal wells themselves may vary according to the nature of the thermal resource being tapped. Wells in the Geysers thermal area of California (a dry steam field) are typically in the $1,000,000 range, while wells in the Imperial Valley of Souther California (a hot brine field) generally cost around $550,000. The National Geothermal Energy Program goals of 3,000 megawatts power-on-line by 1985 and 20,000 megawatts by the year 2000 would require an estimated 2,000 new wells by 1985, and additional 6,600 wells by 1990 and 2,000 more wells per year through the year 2000. At present, fewer than one percent of the total energy-development drilling rigs in the U.S. are utilized for geothermal projects. Major environmental, institutional, and legislative barriers need to be removed before thermal energy production can proceed full-scale. (Eberle-NWWA)
W78-06962

COLORADO PUMP TESTS SHOW HOW TO MAKE BIG DOLLAR SAVINGS,
R. Ross.
Irrigation Age, Vol. 12, No. 6, p 8-9+, March, 1978. 2 fig.

Descriptors: *Irrigation operation and maintenance, *Pumping, Energy, Costs, Efficiencies, Electric power costs, Electric power rates, Conservation.

A recent pump testing program in Colorado has demonstrated a huge potential for electrical energy savings in that state if the average efficiency of irrigation pumps could be upgraded. Program researchers have maintained that efficiencies of 65% are readily achievable by proper pump selection and care, and significant number of systems tested were found to perform at this level. However, average efficiencies in approximately 600 systems tested were only about 45% for open discharge systems and 56-60% for sprinklers. Various remedial measures can be taken to improve pump efficiency, such as adjustment of the impeller, replacement of worn parts, proper sizing, improved well construction, and modification of operating procedures. Unfortunately, present electrical rate structures frequently discourage such measures. Net savings in a declining block rate structure, for example, may be to low to offset the capital cost of upgrading the irrigation system, thus the farmer's decision is not to repair the pump. If irrigation power rates were reformulated so that cost to the farmer were closer to the actual average cost per kwh, then the economic incentive to conserve energy would be enhanced. (Eberle-NWWA)
W78-06964

CHARACTERISTICS OF VAPOR FLASHING GEOTHERMAL PLANTS,
Hawaii Univ., Honolulu. Coll. of Engineering.
R. K. Ahluwalia, and J. C. S. Chou.
Available from the National Technical Information Service, Springfield VA 22161 as PB-262 702, Price codes: A04 in paper copy, A01 in microfiche. Hawaii Geothermal Project Engineering Program, Technical Report No 6, November, 1974. 25 fig, 3 tab, 47 ref.

Descriptors: *Geothermal studies, *Thermal power, Electric powerplants, Design, Brines, Steam, Thermal water, Equipment, Pipes, Turbines, Wells, Generators, Water hammer, Corrosion, Flashing, Cavitation, Pressure, Temperature, Sites.

For purposes of thermal power production, the mixture of steam and water from a geothermal well can be transported in a single pipe without problems of water hammer, cavitation, or vibration. The pressure drop of two-phase flow may be determined by using a correlation method developed by Martinelli and Lockhart. When the mixture reaches the generating plant, steam can be separated from water using a cyclone separator. The output and quality of exhaust steam increase with the number of subsequent flashing stages, however, the number of stages may have to be restricted to two for economic reasons. For a typical well, the flow rate decreases as the wellhead pressure increases. The most critical component is the turbine, for which materials must be carefully selected. Steam jet ejectors should be used to handle non-condensable gases when the content is low. For higher content, the use of centrifugal compressors is advantageous. (Eberle-NWWA)
W78-06966

A REVIEW OF PROBLEMS ON SCALING AND CORROSION IN GEOTHERMAL PLANTS,
Hawaii Univ., Honolulu. Coll. of Engineering.
For primary bibliographic entry see Field 8G.
W78-06968

GEOTHERMAL DOWN-WELL PUMPING SYSTEM,
Sperry Research Center, Sudbury, MA.
R. H. Fuller.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 857, Price codes: A03 in paper copy, A01 in microfiche. National Science foundation Report No NSF/RA-760342, August, 1976. 30 p, 23 fig, 2 tab, 1 append.

Descriptors: *Geothermal studies, *Pumps, *Heat exchangers, Pump turbines, Brines, Thermal power, Wells, Efficiencies, Temperature.

The Sperry downhole pump obtains its energy to pressurize and pump brine directly from the brine itself. One to two percent of the brine flow is sent down to the pumping unit through a downhole heat exchanger consisting of two annuli formed by the well casing and two concentric lengths of standard oil field tubing. The working fluid flows down the inner annulus and hot brine flows up the outer, thus, heat is transferred across the boiler tube into the working fluid. Working fluid vapor drives a turbine (which in turn drives the pump impeller), is condensed, and is then sent downhole for another cycle. In laboratory tests, such a pump equipped with a 900 gpm impeller had a maximum efficiency of 77 percent at .92 design flow. Field testing has been done at 360 degrees F, 75 degrees below design specifications. Significant efficiency losses under these conditions were noted, thus, an organic vapor is suggested as a working fluid under

such low-temperature conditions. (Eberle-NWWA)
W78-06969

8D. Soil Mechanics

STABILITY CHARTS FOR SIMPLE EARTH SLOPES,
University of Tasmania, Hobart (Australia). Dept. of Civil Engineering.
B. F. Cousins.
Journal of the Geotechnical Engineering Division, American Society of Civil Engineers, Vol. 104, No. GT2, p 267-279, February 1978. 9 fig, 11 ref, 2 append.

Descriptors: *Slopes, *Slope stability, *Effective stress, Safety factors, Stability, Charts, Curves, Pore pressure, Equations, Mathematics, Mathematical studies, Critical circle, Stability analysis, Stability criteria, Stability numbers.

Charts were presented for cohesive-frictonal soil which give safety factors and details of critical slip circles for depth factors of 1, 1.25, and 1.50 as well as toe circles. The charts were drawn for pore pressure ratios of 0, 0.25, and 0.50 and for slopes up to 45 deg. A variation of the friction circle method was used to construct the charts. The format of the charts was similar to Janbu's charts so that the need for so much interpolation, extrapolation, and iteration, a characteristic of earlier charts, has been removed. However, Janbu's method for allowing for pore pressure was found to be unacceptable except for small slope angles and low pore pressure ratios. For high slope angles and pore pressure ratios, Janbu's method gives safety factors that are too high. (Visocky-ISWS)
W78-06719

EROSION RATES OF COHESIVE SOILS,
Nielsen Engineering and Research Inc., Mountain View, CA.
For primary bibliographic entry see Field 2J.
W78-06720

TEST FILLS FOR ROCK-FILL DAMS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Soils and Pavements Lab.
D. P. Hammer, and V. H. Torrey, III.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-035 981, Price codes: A08 in paper copy, A01 in microfiche. Miscellaneous Paper S-73-7, March 1973. 171 p, 61 fig, 12 tab, 3 append.

Descriptors: *Rockfill dams, *On-site tests, *Dam construction, *Arkansas, *California, *Kentucky, *Oregon, *Pennsylvania, *Virginia, Data collections, On-site data collections, On-site investigations, Construction materials, Rocks, Methodology, Soil compaction, Compaction, Mechanical properties, Shales, Limestones, Sandstones, Basalts, Gravels, Gradation.

Data from 14 Corps of Engineers' (CE) rock test fill projects were summarized, and six of these projects were analyzed in detail. Variables most often investigated in the test fills were (1) lift thickness, (2) roller type, (3) number of roller passes, and (4) rock gradation. Measured parameters were (1) compaction, (2) permeability, and (3) grain-size distribution, both before and after compaction. The vibratory roller generally gave the best compaction, but it also caused a substantial amount of surficial breakage for most rock types. It was found in most cases that better results were obtained with a vibratory roller when compacting material with the fines (sizes less than + or - 3 in.) removed. The possibility of using the Los Angeles abrasion test to predict rock breakage was explored. However, no conclusions could be drawn due to the lack of data and to the diversity of testing methods used in the projects studied. Recommended procedures for (1) planning and design, (2) construction, (3) measurements and observations, and (4) evaluation of results of future test fills were given. (Humphreys-ISWS)
W78-06871

$70 MILLION FOR DAM INSPECTIONS,
For primary bibliographic entry see Field 8G.
W78-06892

MODULUS OF SOIL REACTION (E') VALUES FOR BURIED FLEXIBLE PIPE,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
A. K. Howard.
Report REC-ERC-77-1, January 1977. 60 p, 12 fig, 2 tab, 13 ref, 4 append.

Descriptors: Backfills, *Soil mechanics, *Buried pipes, *Flexible pipes, Steel pipes, Deflection, Laboratory tests, Plastic pipes, Cohesionless soils, *Pipes, Pipe bedding, Pipelines, Field tests, *Pipe tests, Bedding materials, Construction methods, Trenches, Compaction, Pipe laying, *Pipe design, Fiberglass reinforced plastic pipe, Reinforced plastic mortar pipe, Thermoplastic pipe, Ductile iron pipe, Iowa formula, Soil-structure interaction, *Modulus of soil reaction.

A table of modulus of soil reaction (E') values for use in the Iowa formula has been empirically developed. Use of the methods and values suggested can reasonably predict the initial (no time effect) deflection of buried flexible pipe under fills up to 15 m (50 ft.). The E' values vary according to the type of soil placed beside the pipe and the degree of compaction. The accuracy of predicted deflections varies according to the degree of compaction. Laboratory soil container tests and data from over 100 field installations were used in the investigation. (Bur Reclam)
W78-06929

8F. Concrete

EVALUATION OF LINER MATERIALS EXPOSED TO LEACHATE: SECOND INTERIM REPORT,
Matrecon, Inc., Oakland, CA.
For primary bibliographic entry see Field 8G.
W78-06766

ASBESTOS-CEMENT PIPES FOR OUTFALL SEWER.
For primary bibliographic entry see Field 5D.
W78-07044

8G. Materials

MODIFIED HAZEN-WILLIAMS FORMULA,
Roorkee Univ. (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-06717

APPROXIMATE METHOD FOR COMPUTING BACKWATER PROFILES IN CORRUGATED METAL PIPES,
Federal Highway Administration, Washington, DC. Hydraulic Research.
For primary bibliographic entry see Field 8B.
W78-06722

EVALUATION OF LINER MATERIALS EXPOSED TO LEACHATE: SECOND INTERIM REPORT,
Matrecon, Inc., Oakland, CA.
H. E. Haxo, Jr., and R. M. White.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 913, Price codes: A02 in paper copy, A01 in microfiche. Report No EPA - 600/2-76-255, September, 1976. 54 p, 3 fig, 22 tab, append. 68-03-2134.

Descriptors: *Protective linings, *Impervious membranes, *Leachate, *Landfills, *Leakage, *Durability, Polymers, Plastics, Membranes, Asphalts, Cements, Concretes, Testing, Analytical techniques, *Sanitary landfill linings, *Swelling, Polymeric membranes, *Admix liner materials, Chlorinated polyethylene, Chlorosulfonated polyethylene, Polyvinyl chloride, Ethylene propylene rubber, Polyethylene, Butyl rubber, Hydraulic asphalt concrete, Paving asphalt concrete, Soil asphalt, Soil cement, Blown asphalt, Emulsified asphalt.

Information on the first year's exposure of liner materials to sanitary landfill leachate is presented. Descriptions of the monitoring and disassembly of the generators to recover the liner specimens are given. Test results are presented and discussed. A year's exposure did not result in losses of impermeability in any liner. There were losses in the compressive strength of the 4 admix liner materials tested (hydraulic asphalt concrete, paving asphalt concrete, soil asphalt, and soil cement) and some losses in the physical properties of some polymeric membranes. Swelling of most polymeric membranes occurred and the seams of several lost strength. Heat-sealed seams were most durable. Among the polymeric membranes, the crystalline types of polyethylene, polypropylene, and polybutylene sustained the least change during the year; however, these liners (or films) are prone to puncture and tear and are generally difficult to handle in the field. The thermoplastic membranes (chlorinated polyethylene, chlorosulfonated polyethylene (Hypalon), and polyvinyl chloride) tended to swell the most. The vulcanized rubber liner materials, e.g., butyl and ethylene propylene rubber, changed little during the exposure period but had the lowest initial seam strength. Further research and long-range testing are mandated. (Seip-IPA)
W78-06766

TEST FILLS FOR ROCK-FILL DAMS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Soils and Pavements Lab.
For primary bibliographic entry see Field 8D.
W78-06871

INTERPRETATION OF THE TENSILE STRENGTH OF ICE UNDER TRIAXIAL STRESSES,
Cold Regions Research and Engineering Lab., Hanover, NH.
For primary bibliographic entry see Field 2C.
W78-06884

$70 MILLION FOR DAM INSPECTIONS,
M. J. Bartos, Jr.
Civil Engineering-American Society of Civil Engineers, p 64-68, March 1978. 6 fig.

Descriptors: *Dam failure, *Safety, *Dams, Stability, Maintenance, Maintenance costs, Structures, Engineering structures, Dam design, Inspection, Disasters, Engineering, Civil engineering, Corps of Engineers, Federal laws, Dam inspection, Dam safety, Toccoa Falls Dam(Ga), Non-federal dams.

In 1972, Congress passed the National Dam Inspection Act, requiring the Corps of Engineers to inspect and inventory all dams in the United States. Then in 1976, the Teton Dam in Idaho failed, and the Federal Government began a three-phase study of Federal dam safety. More recently, Toccoa Falls Dam in Georgia failed, prompting Congress to appropriate $15,000,000 for the inspection of 1,800 non-Federal dams by October 1978. The inspections are part of a four-year, $70,000,000 program managed by the Corps to in-

spect 9,000 non-Federal dams. The dams to be inspected were selected because their failures would cause many casualties and/or extensive property damage. For dam safety to become a reality, however, the inspections must be followed by repairs or modifications to dams found deficient. (Sims-ISWS)
W78-06892

ESTIMATING REVERSIBLE PUMP-TURBINE CHARACTERISTICS,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 8C.
W78-06928

MODULUS OF SOIL REACTION (E') VALUES FOR BURIED FLEXIBLE PIPE,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 8D.
W78-06929

GEOTHERMAL WELL COMPLETION,
Texas Univ. at Austin. Center for Energy Studies.
For primary bibliographic entry see Field 8A.
W78-06959

HYDROGEN SULFIDE CONTROL,
Gulf South Research Inst., New Iberia, LA.
P. D. May.
Drilling-DCW, Vol. 39, No. 6, p 54-78, April, 1978. 6 fig, 2 tab, 11 ref.

Descriptors: *Drilling fluids, *Hydrogen sulfide, *Corrosion control, *Iron oxides, Laboratory tests, Hydrogen ion concentration, Acidity, Alkalinity.

Hydrogen sulfide is so highly corrosive that a concentration of 50 ppm in drilling mud will cause high-tensile steel to fail within ten minutes. Small concentrations of this gas reduce the life of drill pipes by a factor of 10. This article reports experiments with 'Ironite Sponge' (a patented product consisting mainly of an iron oxide) as an H2S scavenger. High surface area and small particle size make Ironite Sponge much superior to Magnetite which has previously been used as a weighting material in drilling fluids. Laboratory data confirmed field reports of the effectiveness of the Sponge. Experimental results indicate that one lb. of Sponge removes about 0.70 lb. of H2S. Recommended concentrations of the additive are given for various downhole conditions, and a drilling fluid mixture monitoring procedure is outlined at the conclusion of the article. (Eberle-NWWA)
W78-06960

ELECTRODRIL DEMONSTRATION PROGRAM SHOWS PROMISE,
General Electric Co., Houston, TX.
For primary bibliographic entry see Field 8C.
W78-06961

COLORADO PUMP TESTS SHOW HOW TO MAKE BIG DOLLAR SAVINGS,
For primary bibliographic entry see Field 8C.
W78-06964

CHARACTERISTICS OF VAPOR FLASHING GEOTHERMAL PLANTS,
Hawaii Univ., Honolulu. Coll. of Engineering.
For primary bibliographic entry see Field 8C.
W78-06966

GEOTHERMAL RESERVOIR AND WELL TEST ANALYSIS: A LITERATURE SURVEY,
Hawaii Univ.-Hilo Coll., Hilo.
For primary bibliographic entry see Field 8B.
W78-06967

A REVIEW OF PROBLEMS ON SCALING AND CORROSION IN GEOTHERMAL PLANTS,
Hawaii Univ., Honolulu. Coll. of Engineering.
A. Bhargava, J. C. S. Chou, and D. H. Kihara.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 708, Price codes: A03 in paper copy, A01 in microfiche. Hawaii Geothermal Project Engineering Program Technical Memorandum No 3, June, 1975. 52 p, 20 fig, 4 tab, 36 ref.

Descriptors: *Geothermal wells, *Scaling, *Chemical precipitation, *Corrosion, Calcium carbonate, Carbon dioxide, Silica, Aqueous solutions, Equilibrium, Hydrogen ion concentration, Chlorides, Hydrogen sulfide, Temperature, Pressure, Brines, Thermal power, Equipment, Equations, Geothermal studies.

Deposition of dissolved solids from aqueous solutions and corrosion of metals are two major problems associated with geothermal power production for which no foolproof remedies have yet been discovered. Scaling is dependent upon various factors. Calcium carbonate deposition is primarily influenced by the amount of carbon dioxide in solution, but is also affected by temperature, pH, and perhaps the presence of the Mg+ + ion. Silica deposition, the more serious and prevalent deposition problem, is a function of temperature, pH, and degree of supersaturation of the solution. Corrosion problems result from the presence of gases such as carbon dioxide and hydrogen sulfide, and of agents such as chloride and sulfide ions. These gases and etching ions attack condensers, turbines, and other exposed power plant components, eventually rendering them useless unless corrosion-resistant materials are used in their manufacture. This report discusses in detail the chemical, physical, and mathematical relationships of geothermal scaling and corrosion, and evaluates the potential of some of the remedies have been proposed. (Eberle-NWWA)
W78-06968

GEOTHERMAL DOWN-WELL PUMPING SYSTEM,
Sperry Research Center, Sudbury, MA.
For primary bibliographic entry see Field 8C.
W78-06969

GROUNDWATER QUALITY AND CORROSION: THE AUSTRALIAN SCENE,
For primary bibliographic entry see Field 5B.
W78-06973

ROTATING DISC SEWAGE TREATMENT SYSTEM,
Dickson Environmental Engineering Ltd., Guildford (England).
For primary bibliographic entry see Field 5D.
W78-07006

VACUUM FILTRATION, WITH PARTICULAR REFERENCE TO OPERATIONAL AND MAINTENANCE PROBLEMS,
For primary bibliographic entry see Field 5D.
W78-07007

SEWER JET CLEANER THAWS WATER MAINS.
Public Works, Vol 108, No 12, p 61, December, 1977.

Descriptors: *Sewerage, *Frozen ground, *Freezing, *Thawing, *Conduits, Water pressure, Operation and maintenance, Water conveyance, Conveyance structures, Steam, Municipal water, Municipal wastes.

Frozen water mains in Janesville, Wisconsin, were thawed by jetting water at 42 F through the frozen pipe sections at a hydraulic pressure of 1,000 psi. A total of 8,000 feet of water main was cleared with the sewer cleaning equipment, supplied by Donahue and Associates of Sheboygan, Wisconsin. In sections where pipes, were completely frozen, excavation and cutting of the water main were required to introduce the water nozzle and hose. The nozzle, modified with a three-eighths inch hole in the tip, and the hose were driven through the pipes by the backward pressure of the jets. The pressure from the water jets forced the freed ice in the main back to the excavation areas. A total of 300 feet of water main had to be replaced because of freezing-related damage. The water jetting technique cleared an average of 16 ft of ice/hr as opposed to an estimated 1 ft/hr with steam melting. The entire thawing operation required 62 days and 20 employees. (Lisk-FIRL)
W78-07009

LOCATING UNDERGROUND PIPES AT SEWAGE WORKS.
Pipes and Pipelines International, Vol 22, No 5, p 32, October, 1977.

Descriptors: *Surveying instruments, *Mapping, *Measurement, *Pipes, *Underground structures, Data collections, Electric cables, Instrumentation, Analytical techniques, Subsurface investigations, Waste water treatment, Municipal wastes.

Electrolocation Ltd has designed a GPR 404 subsurface survey instrument for locating underground sewage pipes, cables, and drains. The device was used by England's Thames Water Authority to locate underground structures as part of a program to update records at the Hogsmill Sewage Treatment Works. The survey unit detects, traces, and plots the courses and depths of the sub-surface pipes and equipment. The instrument is equipped with aerials for detecting equipment in areas of high interference and locating manhole covers that have become buried. Plots of individual cables can be isolated from other cables that run alongside. The survey unit can be adapted to pick up the electric signals from underground cables, to induce a signal in dead cables or metal pipes, and to follow a probe that is fed through non-metallic conduits. The survey of the Hogsmill treatment plant was conducted as a prelude to future expansion of the 11.5 mgd facility. (Lisk-FIRL)
W78-07031

INFILTRATION-INFLOW SEWER LINE ANALYZER,
For primary bibliographic entry see Field 5A.
W78-07076

DESIGN GUIDE FOR METAL AND NONMETAL TAILINGS DISPOSAL,
Bureau of Mines, Spokane, WA. Spokane Mining Research Center.
For primary bibliographic entry see Field 5E.
W78-07123

8H. Rapid Excavation

THE ENVIRONMENT OF AMCHITKA ISLAND, ALASKA.
Department of Energy, Washington, DC. Div. of Military Application.
For primary bibliographic entry see Field 6G.
W78-06702

8I. Fisheries Engineering

ANESTHETIC AND HANDLING STRESS ON SURVIVAL AND CORTISOL CONCENTRA-

TION IN YEARLING CHINOOK SALMON (ONCORHYNCHUS TSAWYTSCHA),
Oregon Cooperative Fishery Research Univ. Corvallis.
For primary bibliographic entry see Field 5C.
W78-07021

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

ELEVENTH ANNUAL REPORT PROGRAM ACTIVITIES, JULY 1, 1974-JUNE 30, 1975 (MARYLAND WATER RESOURCES RESEARCH CENTER).
Maryland Univ., College Park. Water Resources Research Center.
For primary bibliographic entry see Field 9D.
W78-06804

9D. Grants, Contracts, and Research Act Allotments

ELEVENTH ANNUAL REPORT PROGRAM ACTIVITIES, JULY 1, 1974-JUNE 30, 1975 (MARYLAND WATER RESOURCES RESEARCH CENTER).
Maryland Univ., College Park. Water Resources Research Center.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 156, Price codes: A04 in paper copy, A01 in microfiche. (1975). 59 p, 13 fig, 1 tab, 43 ref, 3 append. OWRT A-999-MD(11).

Descriptors: *Maryland, *Water Resources Institute, Waste water treatment, Waste water disposal, Chlorination, Aquatic bacteria, Water quality standards, Urban runoff, Flooding, Heavy metals, Sediments, Copepods, Economic impact, Oysters, Shellfish, Food chains, Estuaries, Tidal marshes, Mathematical models, Convection, Adsorption, Dispersion, Cooling tower, Pollutant identification, *Chlorinated effluents, Flood runoff, Thermal stress, Economic development.

A report by the Center Coordinator presents a brief overview of current and anticipated water problems in Maryland and a short description of current research projects. Project progress reports that fall under the annual allotment program are presented and include: Poultry Processing Plant Waste Water Disposal on Sod (A-013-Md); Fish Avoidance of Chlorinated Effluents (A-022-Md); Diffusion and Adsorption of Pollutants in Soils (A-023-Md); Feasibility of Chlorinating Feedlot Runoff to Meet Bacterial Water Quality Standards (A-024-Md); Flood Runoff from Urban Areas (A-025-Md); Heavy Metals in Chesapeake Bay Sediments (A-026-Md); Adaptation of Copepod Populations to Thermal Stress (A-027-Md); Effects of Economic Development on Water Resources (A-028-Md); and Characteristics of Urban Runoff (Title II, C-5341). Matching fund projects include: Uptake and Biochemical Effects of Heavy Metals in Shellfish (Oysters) (B-017-Md); Biochemical and Nutritional Interactions Between the Oyster (Crassostrea virginica (Gmelin)) and its Environment (B-0180-Md); and The Contributions of Tidal Marshlands to Food Chains in Estuaries (B-019-Md); all three projects have been completed and published. A journal article, 'A Predictor-Corrector Method for Solving the Convection-Dispersion Equation for Adsorption in Porous Media' (Water Resources Research, Vol. 10, No. 5, October 1975, p 1003-1011) is included in its entirety. To date, results of 'The Effects of a Cooling Tower on the Environment' are reported. Sections listing publications, theses, and papers presented and describing training and education aspects of the Program are included. (Seip-IPA)
W78-06804

PACIFIC SOUTHWEST INTER-AGENCY COMMITTEE MINUTES OF THE 77-3 MEETING, 13-14 DECEMBER 1977, LAS VEGAS, NEVADA.
Pacific Southwest Inter-Agency Committee, San Francisco, CA.
For primary bibliographic entry see Field 6E.
W78-06815

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

A LOOK AT COASTAL ENGINEERING STUDY IN JAPAN.
Japan Society of Civil Engineers, Tokyo. Committee on Coastal Engineering.
For primary bibliographic entry see Field 8B.
W78-06716

COOLING TOWERS: A BIBLIOGRAPHY (JUNE 1977 - DECEMBER 1977).
Department of Energy, Oak Ridge, TN. Environmental Sciences Information Center.
For primary bibliographic entry see Field 5G.
W78-06763

THE USE OF BIOLOGICAL INDICATOR ORGANISMS TO MONITOR TRACE METAL POLLUTION IN MARINE AND ESTUARINE ENVIRONMENTS--A REVIEW,
National Environment Protection Board of Sweden, Upsala. Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W78-06832

COPPER IN THE SEA - A BIBLIOGRAPHY,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Lab.
For primary bibliographic entry see Field 5C.
W78-06865

COPPER.
National Research Council, Washington, DC. Committee on Medical and Biologic Effects of Environmental Pollutants.
For primary bibliographic entry see Field 5B.
W78-06872

DIRECTORY OF LOCAL ASSISTANCE CENTERS OF THE NATIONAL WATER DATA EXCHANGE (NAWDEX),
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 07C.
W78-06940

10D. Specialized Information Center Services

DIRECTORY OF LOCAL ASSISTANCE CENTERS OF THE NATIONAL WATER DATA EXCHANGE (NAWDEX),
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 07C.
W78-06940

STATUS OF THE NATIONAL WETLANDS INVENTORY,
Fish and Wildlife Service, St. Petersburg, FL.
For primary bibliographic entry see Field 07C.
W78-07159

10F. Preparation Of Reviews

COPPER.
National Research Council, Washington, DC. Committee on Medical and Biologic Effects of Environmental Pollutants.
For primary bibliographic entry see Field 05B.
W78-06872

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W78-07084	2L	W78-07163	2L		
W78-07085	4B	W78-07164	4A		
W78-07086	3B	W78-07165	7C		
W78-07087	4A	W78-07166	5E		
W78-07088	5D	W78-07167	5D		
W78-07089	2E	W78-07168	5D		
W78-07090	2F	W78-07169	2C		
W78-07091	2G	W78-07170	5E		

ABSTRACT SOURCES

SOURCE	ACCESSION NUMBER	TOTAL
A. CENTERS OF COMPETENCE		
Colorado State University, Irrigation Return Flow Quality	W78-06748, 06854	2
Cornell University, Policy Models for Water Resources Systems	W78-06739--06743 07013--07017 07034--07043 07045--07051 07053--07061	36
DOE Oak Ridge National Laboratory, Nuclear Radiation and Safety	W78-06750 07178--07181 07183 07185--07191 07193	14
Franklin Institute (FIRL), Municipal and Industrial Wastewater Treatment Technology	W78-06705--06711 06749, 06785 06814, 06855 06976--06977 07005--07007 07009, 07031 07044, 07076 07078--07079 07081--07082 07088 07150--07151 07182, 07200	29
Illinois State Water Survey, Hydrology	W78-06712--06738 06850--06852 06869--06895 06897 06899--06902 07085--07087 07089--07117	94
National Water Well Association, Water Well Construction Technology	W78-06956--06975	20
University of Florida, Eastern U. S. Water Law	W78-07198--07199	2

ABSTRACT SOURCES

SOURCE	ACCESSION NUMBER	TOTAL
A. CENTERS OF COMPETENCE (CONTINUED)		
University of N. Carolina, Metropolitan Water Resources Planning and Management	W78-06771--06773 06775--06780 06782--06784 06786--06803	30
B. STATE WATER RESOURCES RESEARCH INSTITUTES	W78-06807--06811 06930 06998--07002 07052	12
C. OTHER		
BioSciences Information Service	W78-06774, 06781 06815, 06821 06833 06837--06839 06846, 06866 06896, 06898 07184, 07192 07194--07197	18
Bureau of Reclamation	W78-06903--06905 06926--06929	7
Environmental Information Services, Inc. (Effects of Pollutants on Aquatic Life)	W78-06853 07018--07030 07032--07033	16
Environment Canada (WATDOC)	W78-07165--07177	13
Forest Service (USDA)	W78-06978	1
Information Planning Associates, Inc.	W78-06701--06704 06744 06752--06770 06804--06806 06812--06813 06816--06820 06822--06830 06923--06925 06979 06994--06996 07118--07142	75

ABSTRACT SOURCES

SOURCE	ACCESSION NUMBER	TOTAL
c. OTHER (CONTINUED)		
Ocean Engineering Infor. Service (Outer Continental Shelf)	W78-06831--06832 06834--06836 06840--06845 06847--06849 06856--06865 06867--06868 06906--06922 06980--06983	47
Office of Water Research and Technology	W78-06751, 06997	2
U. S. Geological Survey	W78-06931--06955	25
Univ. of Massachusetts (Wetlands)	W78-06984--06993 07003--07004 07008 07010--07012 07062--07075 07077, 07080 07083--07084 07143--07149 07152--07164	54

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